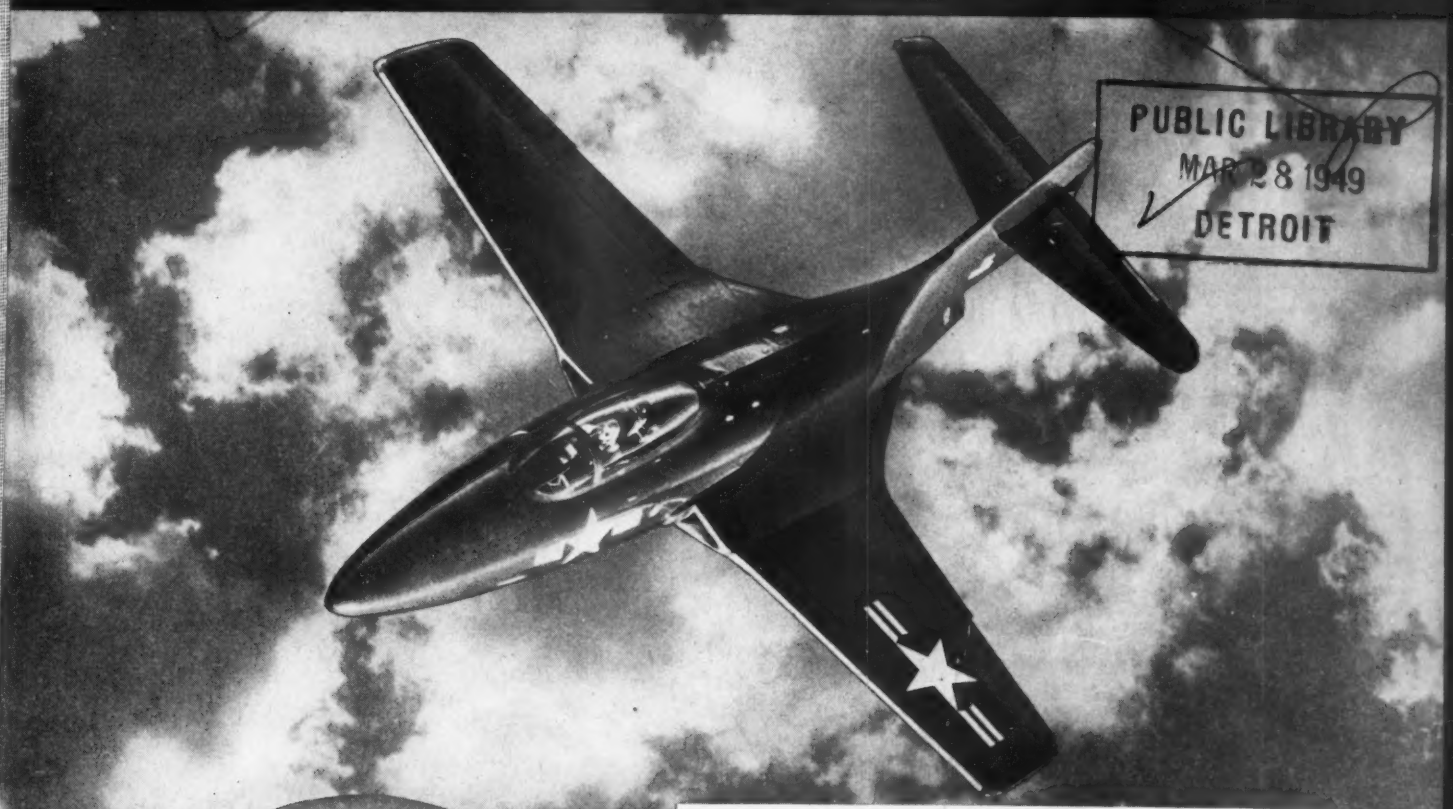
AVIATION WEEK

A McGRAW-HILL PUBLICATION

MAR 28, 194



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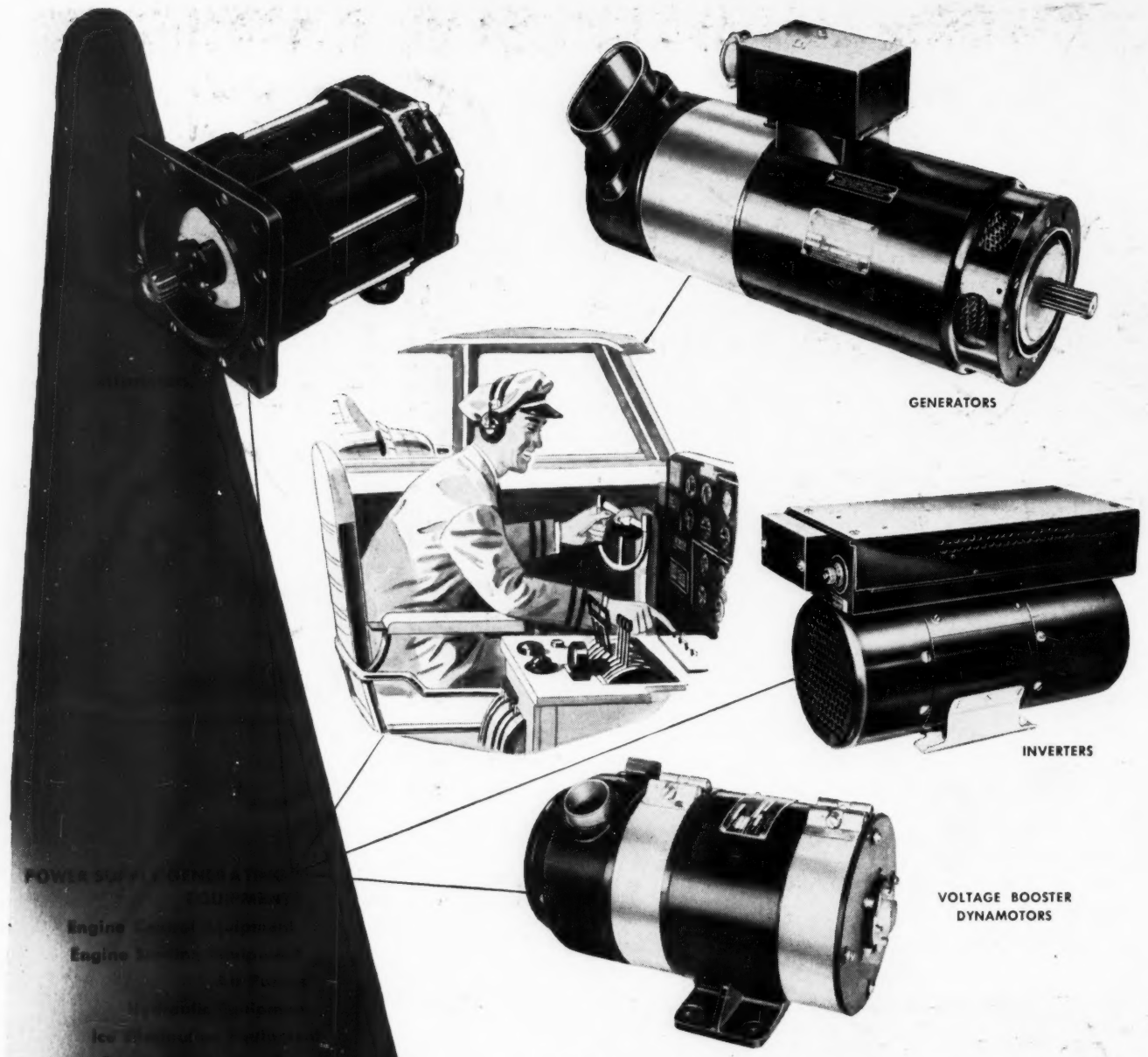

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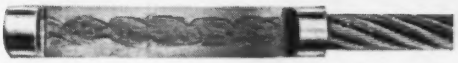
Macwhyte "Safe-Lock" Terminals



Cut-away photo to show fitting and cable after swaging.

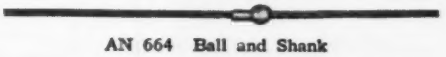
AN 669 Standard Turnbuckle End

AN 668 Standard Eye End

AN 667 Standard Fork End

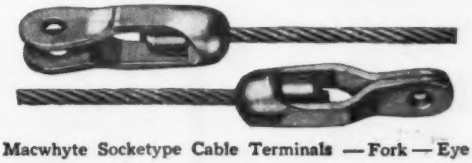
AN 666 Standard Stud End

Plain Ball



AN 664 Ball and Shank

AN 663 Ball and Double Shank



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AVIATION WEEK

Vol. 50, No. 13 — March 28, 1949

News Sidelights	7	New Products	30
Aviation Calendar	8	Financial	33
News Digest	11	Sales & Service	35
Industry Observer	11	Air Transport	39
Headline News	12	Strictly Personal	48
Production	17	What's New	48
Engineering	21	Editorial	50

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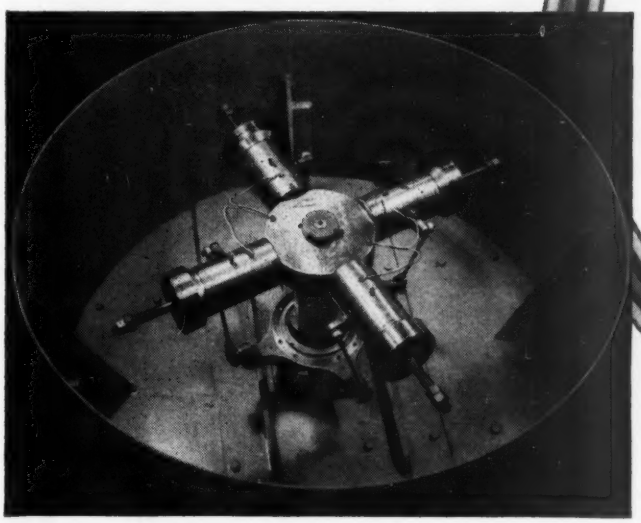
How to pin down a helicopter problem . . .



Testing ball bearings for rotor cyclic pitch control. Helicopter rotor shaft and blade control mechanism mounted within steel cage at Fafnir research laboratory . . . for measuring bearing performance under flight conditions.

Write today for the new RED catalog of Fafnir Aircraft Ball Bearings which includes all new bearing sizes.

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Up in the air, things happen to ball bearings that are 'way outside the experience of anyone making ordinary ball bearings. That's why Fafnir set up a separate plant, research facilities and specialized personnel for the development and production of aircraft ball bearings.

For instance, the large-diameter, thin-section duplex ball bearings for the rotor cyclic pitch control in helicopters. These bearings have to take the brunt of the levering action as well as the customary radial and thrust loads.

Like the rest of the aircraft industry, the Fafnir Aircraft Division can't wait for demand before starting development work. Research and engineering have to go on continuously, anticipating demand, keeping pace with design progress. That takes continuing faith in the industry. It also means that, when the industry is ready to go, Fafnir is ready to go along . . . with full stocks of all types and sizes of aircraft ball bearings, with a full complement of industry-trained workers and specialized facilities.

It's the reason Fafnir has been responsible for most of the major developments in ball bearings for aircraft and the best possible reason for making Fafnir first choice for aircraft ball bearings and air-minded cooperation. The Fafnir Bearing Company, New Britain, Conn.

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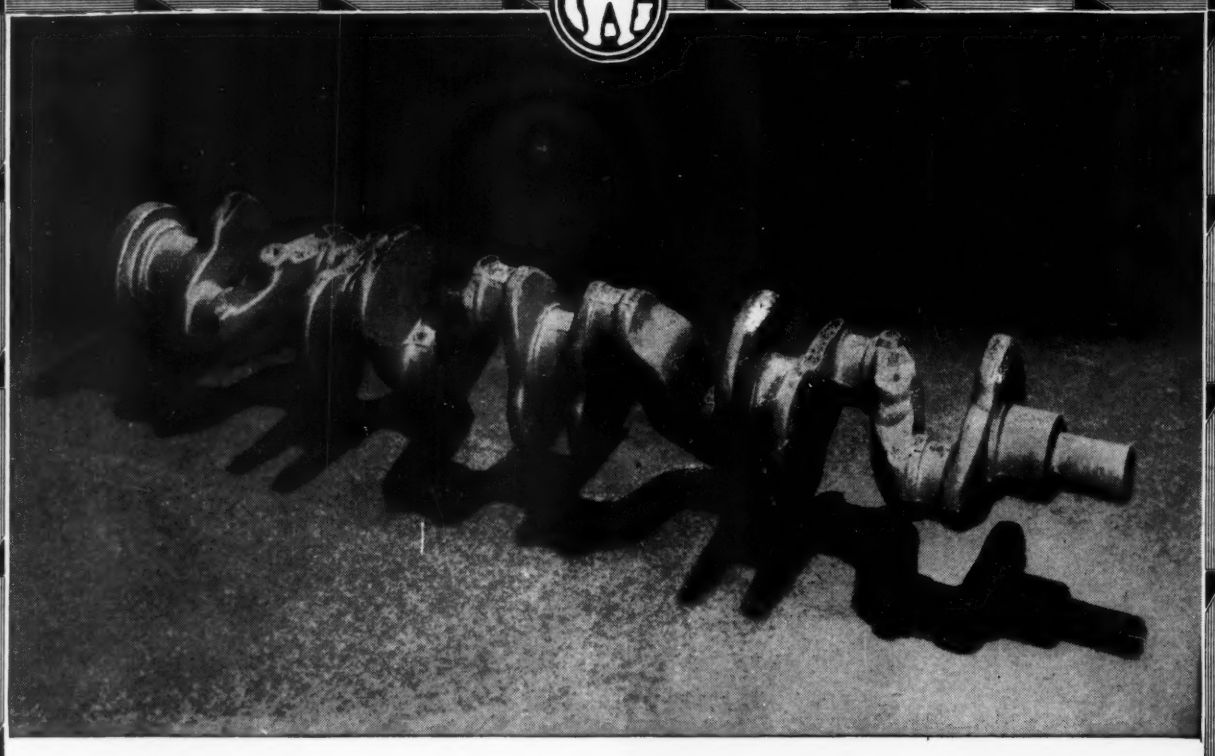

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NEWS SIDELIGHTS

Nonsked Troubles

Haphazard operations of some nonscheduled airlines on the New York-Puerto Rico run are continuing to produce near scandals.

Travelers' Aid Society reports repeated instances in which planeloads of Puerto Ricans have been left stranded for up to 2½ days at a Miami airport with no money for food or lodging.

On one occasion, the society asserts, an irregular operator flew 28 Puerto Ricans from New York to Miami but refused to take them on to San Juan because the agency in New York which had sold the tickets had not telegraphed money due the pilot. Travelers' Aid fed the hungry passengers.

About the same time, one group of 42 and another of 51 Puerto Ricans were stranded without funds at Florida points because their planes developed engine trouble.

DME Specs

International agreement on development specifications for ultra high frequency distance measuring equipment was reached during recent meetings in Montreal of the Communications division of ICAO.

Group adopted the specifications proposed by the U.S. Radio Technical Commission for Aeronautics with only minor technical changes.

Traffic Control

One of the big arguments in thrashing out details of the development of the all-weather electronic airways system will be over who will control dispatch and arrival of aircraft using the system.

Airlines have bitterly fought any attempt by Civil Aeronautics Administration to control dispatching of airliners and will probably make an issue of any new attempts to take that function away from individual airlines in the new airways and traffic control system.

USAF Erratum

U.S. Air Force is blaming one of its own rewrite man's over-simplification enthusiasm for the statement that a USAF study concluded that it was impossible to develop an intercontinental bomber within the next 6-8 years.

Statement appeared in Gen. Hoyt Vandenberg's report for fiscal 1948 (AVIATION WEEK, Jan. 17) along with the conclusion that USAF would have to depend on aerial refueling to achieve the ranges required for intercontinental bombing operations. These statements later proved somewhat embarassing to a USAF engaged in selling the Convair B-36 as an intercontinental bomber.

USAF explanation is that a rewrite man generalized from a 1947 report concerning the specific range possibilities of the B-52 which was then being considered as a 480,000 lb. monster. Powerplant progress since that report was written has convinced USAF that it is possible for a smaller version of the B-52 to attain the ranges once labeled impossible by the USAF report.

Split Decision

A split decision on the USAF trainer plane competition may result in both Fairchild and Beech getting contracts for parts of the trainer order, according to Pentagon sources last week.

Fairchild's entry, powered with a 295 hp. Lycoming engine, (variation of the XNQ-1 trainer originally designed for the Navy) and the Beech Model 45, powered with a 185 hp. Continental, (single-tailed development of the commercial Bonanza) were reported closely competitive in performance, at flight tests conducted recently at Wright Field.

Tricycle geared Beech trainer had been previously pricetagged by company at around $20,000. Neither Fairchild nor Beech bid prices were disclosed but it was understood Fairchild price was about $20,000 higher.

PRO Puzzle

Consolidation of all military public relations activities in a single group under the direct thumb of the Secretary of National Defense is stirring mixed reactions in Washington.

Some observers believe it will mean a tighter security clamp aimed more at preventing embarassment to the military than protecting legitimate military secrets. Other Washington veterans predict a flood of unofficial leaks in the official security dam. Many are chuckling over fact that pretext for the public relations consolidation was the alleged disclosure of USAF plans for atom-bombing key Russian cities in recent daily newspaper stories.

Actually BUSINESS WEEK, a McGraw-Hill publication, published on Apr. 3, 1948, the story of Operation Avalanche, the USAF plan for atomizing key Russian targets, with the notation that this information was being leaked all over Washington at that time.

Haylift Bill

Air Forces' bill of $30 million for its much-publicized "Operation Haylift" has cooled most western Congressmen on the project.

USAF has informed them that the cost will be approximately $100 for each bale of hay dropped to snowbound livestock herds during the recent mountain area snow disaster. This is aside from the cost of the hay.

"The operation did give valuable training experience, we are told, and I suppose it does deserve credit for keeping some cattle and sheep alive and perhaps saving some lives by dropping supplies", one western Congressman remarked. "Of course the only thing we are sure of is that it killed a couple of people with hay bombs—and gave the Air Force good publicity."

Landis Prods PAA

Former CAB Chairman James M. Landis, who already has put the Pan American Airways-American Overseas Airlines merger far behind its express timetable, is hard at work setting up new roadblocks. PAA and AOA have indicated that unless a decision on the merger appears likely by Sept. 15 or soon thereafter may be called off.

Most observers believe the prospects of meeting this deadline are dim. Landis, who represents AOA employes opposed to the North Atlantic route transfer deal, failed in his effort to have CAB dismiss or postpone consideration of the case. But he is now demanding that PAA be required to produce hitherto confidential data which might prove acutely embarrassing to Pan American if made public.

Part of the material requested deals with PAA's alleged attempts to frustrate government policy by hampering the operations of competing U.S. flag lines certificated over North Atlantic and South American routes.

Other data sought by Landis deals with Pan American's bookkeeping practices, whereby anticipated mail pay instead of actual mail pay is reported.

PAA asserts that Landis is making improper use of confidential information, formerly made available to him as CAB chairman.

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Aircraft Fire and Over-Heat Detectors
SENSITIVE . . . but only to heat

AVIATION CALENDAR

Apr. 11-13—Society of Automotive Engineers national aeronautic and air transport meeting, Hotel New Yorker, New York.

Apr. 11-16—Western Metal Congress and Exposition, sponsored by American Society for Metals, Shrine Civic Auditorium, Los Angeles, Calif.

Apr. 19-20—Fifth annual meeting of the Magnesium Assn., Edgewater Beach Hotel, Chicago.

Apr. 19-21—AIEE southwest district meeting, Baker Hotel, Dallas, Tex.

Apr. 21-22—National Agricultural Aviation Conference, Municipal Auditorium, Kansas City, Mo.

Apr. 24-27—American Assn. of Airport Executives convention, Oklahoma City.

Apr. 29-30—Sixth IAS personal aircraft meeting, Hotel Allis, Wichita.

Apr. 30-May 1—Fourth annual southeastern air show and exposition, Craig Field, Jacksonville, Fla.

May 2-4—2nd annual meeting of the Airport Operators Council, Denver.

May 3-20—Third annual foreign transportation institute, American University, Washington, D. C.

May 5-6—Purdue University School of Aeronautics air transportation conference, Lafayette, Ind.

May 10—IATA traffic conferences, Europe.

May 17—IATA technical conference, Switzerland.

May 18—National Fire Protection Assn. committee on aviation and airport fire protection, Fairmont Hotel, San Francisco.

May 19-21—Society for Experimental Stress Analysis, spring meeting, Hotel Statler, Detroit, Mich.

May 23-26—Eighth national conference, Society of Aeronautical Weight Engineers, Inc., Biltmore Hotel, Dayton.

May 24-27—Second joint conference of IAS, Royal Aeronautical Society, Hotel Astor, New York City.

May 26—IATA executive committee, Montreal.

June 3-12—Sixth annual Michigan Aviation week.

June 4-5—Fourth annual air fair and industrial exposition, Shawnee, Okla.

June 7—Third ICAO assembly, Montreal.

June 20-24—AIEE, summer general meeting, New Ocean House, Swampscott, Mass.

June 26-27—NAA 27th annual national convention, Akron, Ohio.

Sept. 1-7—International conference of Federation Aeronautique Internationale, Wade-Park Manor, Cleveland, Ohio.

Sept. 3-5—National Air Races, Cleveland.

Sept. 12—IATA fifth annual general meeting, The Hague.

PICTURE CREDITS

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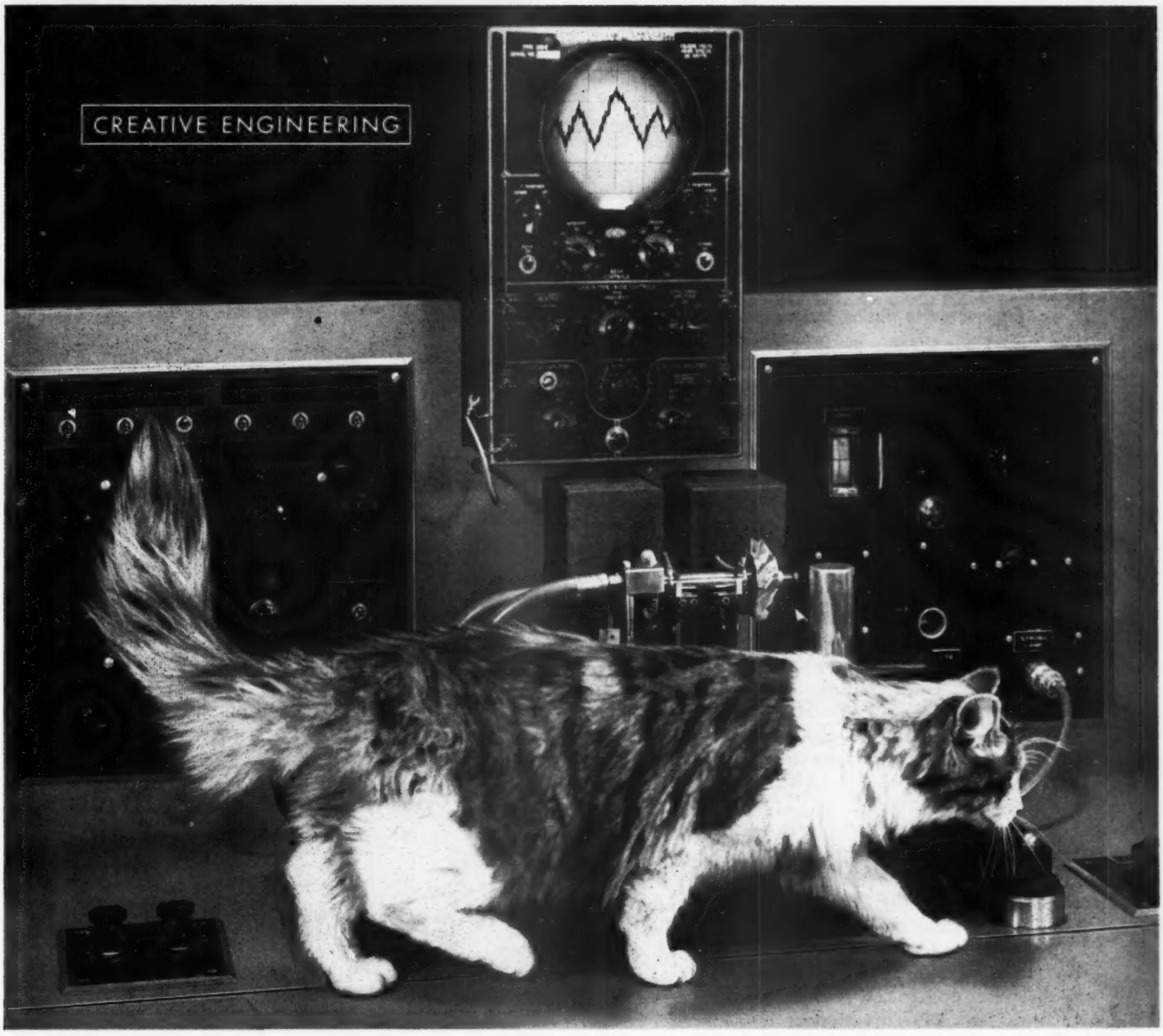

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Electric impulses leap across the "scope" of this fantastic balancing machine—so delicate it can record the footfall of a kitten walking on a steel table two feet away!

To meet unsolved critical needs in the cooling and pressurizing of the new sonic-speed jet airplanes, AiResearch has perfected a new kind of refrigeration turbine. Heart of this turbine is the fan rotor which operates at speeds in excess of 100,000 rpm. It was to precision control the manufacture of this rotor to a tolerance of 5 millionths of an inch that AiResearch engineers designed and constructed the balancing machine shown above.

The ability of AiResearch not only to design but to manufacture and test equipment that will stand up under the toughest conditions is the reason the majority of all high-altitude and jet type aircraft produced in the U.S. are AiResearch equipped.

● Whatever your field—AiResearch engineers—designers and manufacturers of rotors operating in excess of 100,000 rpm—invite your toughest problems involving high speed wheels. Specialized experience is also available in creating compact turbines and compressors; actuators with high speed rotors; air, gas and fluid heat exchangers; air pressure, temperature and other automatic controls.

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This is it . . . the ultimate answer to your aviation radio requirements. Here is a transmitter of minimum weight *that gets out.* And a receiver of minimum weight that brings in the signals . . . through all sorts of weather. Here, we believe, are two of the finest communication units yet designed and built . . . with no engineering effort spared to make them so.

About the Transmitter AVT-49— This completely self-contained unit delivers 50 watts of power, voice or cw, over a frequency range of 2.85 to 13 mc. It provides automatic band change—with a choice of four independent pre-set, crystal-controlled frequencies. Weight? Only 42½ pounds, completely installed. Size? One short ATR . . . fits any standard airline rack. Available for either 12- or 24-volt operation. Everything remotely controlled.

About the Receiver AVR-22— The AVR-22 provides continuous tuning over the three frequency bands important to commercial aviators—weather and range (150-420 kc), standard broadcast (550-1620 kc), and standard aircraft (2.83- 8.05 mc). In addition, it permits instant switching to any one of four pre-determined crystal-controlled frequencies in the range of 2.83 to 13 mc, plus the airport tower frequency of 278 kc. For accurate homing and position-finding, the AVR-22 may be used with any RCA loop antenna, without modification. There is also provision for interphone communications and side-tone transmission monitoring. Weight? Only 21 pounds. Size? A short one-half ATR . . . fits any standard airline rack. Available for either 12- or 24-volt operation. Complete remote control.

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◀ Now ready—two free brochures that fully describe and illustrate the RCA "49" and "22".

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Transmitter Control for type AVT-49

RCA Aircraft Receiver type AVR-22

Receiver Control for type AVR-22

AVIATION SECTION

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NEWS DIGEST

DOMESTIC

Consolidated Vultee Aircraft Corp. has changed the name of its subsidiary set up to lease transport planes. New title is Airfleets, Inc., and according to present plans headquarters will be established in Albuquerque, N. Mex.

Civil Aeronautics Board ordered five feederlines and one helicopter operator (Yellow Cab Co. of Cleveland) to begin service on their certificated routes by July 1. Feeders are: Parks Air Lines, East St. Louis, Ill.; Central Airlines, Oklahoma City; Roscoe Turner Aeronautical Corp., Indianapolis; Iowa Airplane Co., Des Moines; and Arizona Airways, Phoenix.

Post Office Department announced at CAB prehearing conference that it will not support helicopter mail service in New York City area. Conference was in connection with route applications proposing service similar to that previously authorized for Los Angeles and Chicago.

FINANCIAL

Lockheed Aircraft Corp. reports profit of $6,239,380 for year ended Dec. 31 on sales of $125,620,700, of which 75 percent was military, the balance commercial. Earnings equaled $5.80 per share. Year-end employment was 15,905, and backlog $195,901,000.

Douglas Aircraft Co. reports profit of $5,829,206 for year ended Nov. 30, 1948, on sales of $118,581,847, earnings equaling $9.71 a share. Sales were nearly $10 million under the preceding year. Nov. 30 backlog was $232,989, up $81 million from the fiscal 1947 figure. Air Force orders were 43 percent of the total, Navy business, 54 percent.

Republic Aviation Corp. reports profit of $2,196,475 for year ended Dec. 31 on sales of $49,816,896. In 1947, company lost $2,079,585 on sales of $38,280,857. Mar. 1, 1949, backlog was $52 million.

Grumman Aircraft Engineering Corp. reports profit of $2,393,311 for year ended Dec. 31 on sales of $41,031,000. Of the $182 million backlog as of Dec. 31, $107 million was in uncompleted contracts and the balance in letter of intent on which company had not yet received actual contract.

FOREIGN

British test pilot George Pegg is learning to fly the B-36 at Ft. Worth in preparation for test flying the Bristol Brabazon, which has a span (230 ft.) equal to the B-36 and weighs only 30,000 lb. less (320,000 vs. 290,000 lb.)

INDUSTRY OBSERVER

► **Look for civilian jet racing planes to make their first appearance in the money events of the National Air Races, probably in 1951. Racing pilots and show management appreciate that the war-surplus piston-engine fighter competition has gone about as far as it can go, and the proposed revision to smaller horsepower limitations may be altered again if enough development progress is made soon on small jet powerplants.**

► Canadair Ltd., Montreal, is expected to obtain orders for another 19 DC-4 aircraft from British Overseas Airways Corp. to take the place of grounded BOAC Tudor aircraft. While no definite order has been placed yet, opinion at Montreal points to this possible development with completion of the 22 aircraft Canadair is now building for BOAC.

► **British are now flying prototypes of two new swept-wing jet fighters. U. S. has one swept-wing fighter in production (F-86A) and three other types flying as experimental models (XF-88, XF7U-1 and XF-91). The Hawker P-1052 is a swept-wing version of the company's earlier N7/46 model and is powered by a single Rolls Royce Nene turbojet. The supermarine 510, another Nene-powered fighter is the swept-wing version of the Attacker (Aviation Week, Feb. 14). A new version of the Westland Wyvern powered by a Rolls Royce Clyde turboprop engine is also flying. The Wyvern was designed as a Royal Navy attack plane.**

► DeHavilland has made the first entry in a proposed England to New Zealand air race to be held in 1953. Arrangements for the race have not yet been completed but are expected to follow general lines of the England-Australia race of 1934. DeHavilland will indicate which of their planes will fly the race after arrangement details are settled.

► **Royal Air Force's latest bomber, the Avro Shackleton, made its first flight early in March. Plane was designed for long range reconnaissance functions of the RAF coastal command. It is powered by four Griffon piston engines.**

► Cierva's "Air Horse" helicopter has completed 2 hr. 30 min. of flight tests in addition to its 10 hr. running time on the ground. It is now being stripped for structural examination and strengthening of the main booms.

► **Bell Aircraft Corp. is getting an additional $382,000 in subcontracts from Boeing on the B-47 jet bomber production project. Bell's latest business calls for manufacture of crew members' seats and installation equipment for stabilizers and elevators. Bell also has a Boeing subcontract to make jet engine nacelles for the B-47.**

► Piasecki's XHJP-1, three versions of which are now flying, is also a flying scale model of the XH-16 transport helicopter with detachable cargo compartment. The XH-16 was originally developed for the U. S. Air Force but has become a joint USAF-Navy project since the helicopter will meet Marine requirements for a new transport type rotary wing aircraft.

► **Parts of the Chance Vought Cutlass (XF7U-1) twin jet Navy fighter that disappeared recently on a routine flight near Patuxent, Md., were found by fishermen in Chesapeake Bay not far from where the plane was last seen. Neither Navy nor Chance Vought officials have been able to determine the cause of the crash. Best guess: mid-air collision with one of the famed Maryland buzzards. Last known buzzard-Navy collision near Patuxent sheared off the tail of a McDonnell Phantom but pilot bailed out successfully.**

► United Helicopters' initial production of Hiller 360 utility helicopters has reached assembly line proportions at the company's Palo Alto, Calif., plant, with the tenth machine nearing completion. First commercial delivery was made last month. At last report a demonstrator on national tour was in Missouri and enroute to the East Coast to New York and Washington. In addition to direct sales, the national tour will produce operating maintenance cost data and will enable several thousand guest riders to fly the machine and have demonstrations of its "inherent stability."

Vol. 50, No. 13

AVIATION WEEK

March 28, 1949

Domestic Trunkline Traffic

Carrier	Revenue Pass. Miles (Add 000) 1948	1947	Pass. Load Factor 1948	1947
American	1,303,068	1,379,323	60.6	70.1
Braniff	193,806	199,634	54.2	61.6
Capital	275,770	288,470	49.0	54.0
Chi. & So.	105,173	111,643	56.3	58.4
Colonial	39,194	37,855	61.1	61.4
Continental	58,656	58,926	50.4	55.4
Delta	183,162	201,048	52.1	60.7
Eastern	965,264	884,300	58.9	60.3
Inland	26,852	27,810	59.0	64.6
Mid-Continent	93,165	81,873	58.4	61.9
National	90,442	157,343	38.4	54.7
Northeast	52,092	62,142	48.0	51.2
Northwest	325,283	346,873	56.3	69.0
TWA	847,677	817,883	57.9	66.3
United	1,155,974	1,189,109	65.4	75.3
Western	106,962	166,396	55.0	62.0
Totals	5,822,540	6,010,628	58.3	65.7

(Scheduled Operations Only)

Airline Traffic Tops 1948 Levels

Although domestic trunklines are flying more revenue passenger miles, overall deficits are still high.

By Charles Adams

A spectacular safety record and widespread use of traffic-generating tariffs such as the first-of-the-week family fare plan have pushed domestic airline passenger business moderately above last year's levels.

But profitwise, the carriers have again started out on the wrong foot. Although revenue passenger miles flown by the 16 domestic trunklines increased more than 6 percent in January, 1949, over the same 1948 month, tentative figures indicate that overall deficits were still substantial.

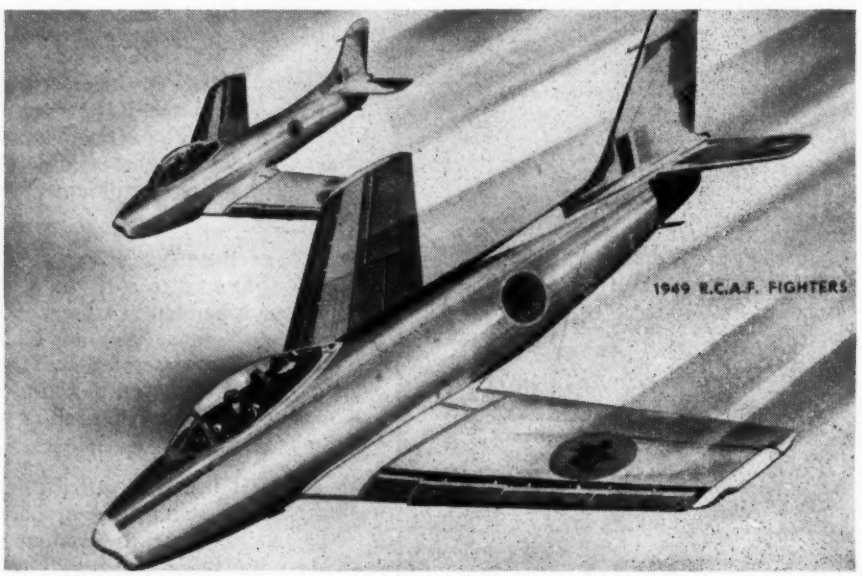
►**American, UAL Gain**—Companies such as American Airlines and United Air Lines, which made a very poor showing during first quarter 1948 because of DC-6 grounding, achieved large passenger traffic gains in the first two months of this year. TWA and Eastern Air Lines, which benefited from DC-6 grounding last year, found passenger traffic during the first two months of 1949 had dropped considerably.

Final 1948 traffic figures show the 16 domestic trunklines flew 5,822,540,000 revenue passenger miles in scheduled service, down more then 3 percent from the 6,010,628,000 mark set in 1947. Average passenger load factor for long-haul operators fell from 65.67 percent in 1947 to 58.34 percent last year. While revenue passenger mileage declined, total number of passengers flown on domestic trunkline schedules rose from 12,279,016 in 1947 to 12,324,033 in 1948.

►**Freight at New Peak**—Scheduled domestic freight ton mileage reported by domestic trunklines leaped from 35,213,590 in 1947 to 69,972,097 in 1948 as certificated operators took the freight-carrying lead away from their uncertificated competitors for the first time in the postwar period. Mail ton miles rose from 32,878,825 in 1947 to 37,505,985 in 1948, and express volume handled by domestic trunklines moved ahead slightly from 28,533,362 ton miles in 1947 to 29,768,883 last year.

In January, 1949, domestic trunklines flew 419,789,000 revenue passenger miles against 394,280,000 in the same 1948 month, when DC-6s were grounded. American Airlines made the sharpest gain, jumping from 74,685,000 to 99,086,000 revenue passenger miles. United's volume increased from 63,686,000 in January, 1948, to 75,751,000 in January, 1949; and Capital, Colonial, Delta, National and Northeast also showed gains.

Eastern Air Lines' revenue passenger mileage slumped from 86,227,000 in January, 1948, to 78,406,000 in January, 1949, and TWA's domestic traffic from



CONFIDENT CANADIANS

Royal Canadian Air Force is apparently certain that it will get North American F-86A jet fighters during 1949. The drawings of the F-86A with RCAF insignia and legend "1949 RCAF Fighters" appeared on the cover of the February issue of the Roundel, official service journal of the RCAF. North American Aviation Inc., is negotiating with Canadian Car and Foundry Co. of Montreal, on an F-86 licensing agreement.

64,185,000 to 55,518,000. Mail ton mileage flown by the domestic trunklines was up 20 percent in January of this year over the same 1948 month, and freight ton mileage gained 33 percent. But air express volume fell 15 percent as considerable business shifted to air parcel post.

▶**Trend Continues in February**—Incomplete reports on February traffic indicate it was also ahead of the same 1948 month. United Air Lines already has announced that its domestic revenue passenger mileage in February was 72,148,000, against 58,359,000 in February of last year. Passenger traffic of American, National, Northeast and Colonial was up substantially over February, 1948, although TWA and probably Eastern continued to lag behind last year's levels.

Meanwhile, a flood of CAB mail pay orders has wiped out the domestic trunklines' operating deficit for 1948 which at one time last fall seemed destined to approach the record $20 million mark set in 1947. The retroactive mail hikes have not only given the industry a small operating profit for 1948 but have trimmed several million dollars from deficit previously reported for 1947.

While the 16 domestic trunklines as a group now show a modest operating profit for 1948, they still have a sizable net deficit. This red ink may be blotted up by future retroactive mail rate adjustments.

▶**January Losses Cut**—Largely because of the sharply-slashed deficit reported by American Airlines, the domestic trunklines cut their January, 1949, operating loss to less than $4 million against nearly $5 million in January, 1948. American lost only $355,000 in January of this year against a $1,832,000 operating deficit in the same 1948 month.

Delta and National, which were well in the red during the first month of 1948, showed profits early this year.

▶**Flag Lines Report**—U. S. international flag carriers operating over the North Atlantic report that traffic during the past winter was the highest in history. Aided by special excursion fares, American Overseas Airlines increased its revenue passenger mileage from 7,708,000 in January, 1948, to 10,235,000 in January, 1949; TWA from 12,773,000 to 16,948,000; and Pan American Airways' Atlantic division from 16,800,000 to 17,936,000.

TWA said that during January, 1949, it carried 26 percent more overseas passengers eastbound and 29 percent more westbound than in January, 1948. In February the increases were 49 percent and 22 percent, respectively. TWA's loss of $606,000 on international operations in January, 1948, was cut to $144,626 in the same month this year.

B-36 Changes Europe's Air Plans

Europeans feel importance of overseas bases to U. S. has lessened, so defense is up to Britain and France.

By Boyd France

(*McGraw-Hill World News*)

PARIS—A growing conviction among many European military strategists that the U. S. will be neither willing nor able to defend Western Europe against the Russians has put a new sense of urgency behind Western Union defense planning.

The B-36 is partly responsible for these new jitters. Key French airmen figure this way:

The atom bomb is the key to U. S. grand strategy. U. S. is counting on it almost exclusively to redress the unfavorable balance of ground forces in the initial phase of any conflict with Russia. Until development of the B-36, the U. S. felt it had to have bases ringing the Soviet blockhouse from which to launch its atom-bearing bombers. It was doubtful how long such bases could be defended from ground attack, but the U. S. could be counted on to make a good attempt at defending them.

Now, according to these French air strategists, the B-36 could conceivably shatter Russian nerve centers from Western Hemisphere fields. Therefore, the U. S. air fields in Europe are no longer vital to American strategy; the U. S. can no longer be counted on to put up a real fight for them.

▶**Defended By Europeans**—Many military leaders are becoming convinced that Western Europe must be defended by Europeans if it is to be defended at all. But there are stumbling blocks in the way of Western Europe's defense effort.

National pride makes each country reluctant to sacrifice any part of its armed forces or the war industries behind them in the interests of greater specialization and efficiency. In the case of the French aviation industry, the reluctance is particularly acute. If the French confided manufacture of combat aircraft for Western Europe to the more highly developed British aviation industry, the French could then specialize in the manufacture of aerial armament and precision instruments, for which, in many cases, it is better adapted than its British counterpart.

▶**Politics A Factor**—But any far-reaching specialization of this kind would be nearly impossible politically in France today. Gaullists and Communists would be sure to fight such a suggestion. They could probably rally a decisive section of liberal opinion behind them, with appeals to French national pride.

National pride isn't the only stumbling block. Complete military specialization means taking a security gamble on the capacity of Western Europe as a whole to defend itself successfully. If any member of the Western Union were knocked out of the conflict early, the advantages of division of production for defense might backfire.

▶**Serious Danger**—French and British military men take this danger seriously. The British don't want to turn over all manufacture of aerial armament to France if the chances are heavy that France would be overrun by the Red Army in the first weeks of combat.

The French feel the same way about letting Britain manufacture all Western Europe's fighter aircraft. They point out that the British Isles—like Japan—are an ideal target for atomic weapons.

The Western countries sacrificed some national sovereignty in planning a defensive radar network (AVIATION WEEK, Mar. 21) where tradition is not so thick and competition not so fierce. So even if they cannot extend this degree of cooperation to other defense fields, some military strategists have been known to mutter, Western Europe will at least know what hit it, if war comes.

NAA Asks Revival Of USAF Jet Race

Revival of USAF jet plane closed course racing over a course with fewer sharp turns was recommended for the 1949 National Air Races at Cleveland, Sept. 3, 4 and 5, by the National Aeronautic Assn. contest committee.

USAF withdrew its fighters from closed-course competition at the Cleveland races last year because of the compressibility beating planes and pilots took in the tight closed-course jet Thompson race in 1947.

▶**Navy in Bendix**—Continuation of Navy jet participation in the Bendix cross country race from the West Coast to Cleveland was recommended for 1949. It was proposed that Bendix planes start from Rosamond Dry Lake, 50 mi. north of Los Angeles, to provide room for simultaneous takeoff in a racehorse start. Under this arrangement the first plane to cross the finish line at Cleveland would be the winner,

eliminating timing basis confusion at the finish which sometimes prevailed with the single Bendix starts from Van Nuys, Calif.

A third recommendation is for an inter-city race by National Guard jet planes, somewhat resembling the Allison Trophy Race run last year by Navy jets between Cleveland and Indianapolis. All recommendations for the service jet competitions are subject to confirmation by the National Military Establishment.

▶**Same Thompson**—Thompson Trophy reciprocating engine race will be run under essentially the same conditions in 1949 as in 1948, on a 15-mi. closed course, for 20 laps with virtually no limitations on power.

Committee is still considering a proposed revision of the 1950 Thompson race to limit powerplants to 500 cu. in. displacement which would put the power upper limit down somewhere in the 200-250 hp. class. This would make the race more a matter for original design competition.

At the committee session, held in Cleveland, were Roger Wolfe Kahn, Garden City, L. I., chairman; Arthur C. Chester, Los Angeles, president of Professional Racing Pilots Assn.; Ben F. Franklin, NAR managing director, Col. Al Boyd, chief of AMC flight test section, Wright Field, and Charles Logsdon, NAA contest director.

Johnson Pledge

Senate Armed Services Committee approved the nomination of Louis A. Johnson (AVIATION WEEK, Mar. 14) to be Secretary of Defense on the condition that he sign a written pledge that he has "divorced himself from any companies doing business with the government."

Johnson informed Committee Chairman Sen. Millard Tydings (D., Md.) that he would sign such a statement. Johnson was formerly a director of Consolidated Vultee Aircraft Corp., and his law firm had represented Slick Airways, all-cargo airline with headquarters in San Antonio, Tex.

Tydings said the committee had analyzed a statement by Lester P. Barlow, inventor and former employe of the Glenn L. Martin Co., charging that Johnson was connected with a large aircraft corporation and stood to gain heavily from his government post. Glenn L. Martin, company president, wrote the committee a strong endorsement of Johnson for the defense post.

Scale model cutaway of Doman Pelican shows unique "cab-over-engine" feature.

New Utility Helicopter Being Built

A new utility helicopter, unusual both in configuration and in its high weight to power ratio, is being constructed by Doman Helicopters, Inc., and is expected to be flying in September.

Designated the L-2A "Pelican" by its Danbury, Conn., manufacturer, the craft has a gross weight of 3200 lb. and a useful load of 1400 lb. with a 245-hp. Aircooled Franklin engine. Power loading works out to a bit over 13 lb. per hp., compared to 11.5 to 12.6 for other copters of its type.

▶**Center of Gravity**—As a passenger vehicle, the Doman helicopter will have accommodations for five in the after cabin, with pilot and copilot side-by-side up front. Engine is in the nose of the craft, with pilot and copilot seats above, giving a "cab-over-engine" effect.

As a result of this placement of the engine, Doman claims, there is no problem with center of gravity limit when the craft is lightly loaded or fully loaded, as the compartment used for either passengers or cargo is located astride the center of gravity.

This main compartment measures 7 ft., 2 in. long, by 4 ft., 7 in. high by 4 ft., 9 in. wide.

▶**Rotor System**—While new and different from other helicopters in most respects, the real key to Doman's sales hopes is in the rotor system. With highly flexible blades rigidly attached to the hub, the system omits hinging, dampers and bearings—making possible low-cost production and virtually eliminating vibration.

The rotor head already has been tested for more than a year on a Sikorsky R-5 under an Air Force contract with what the company describes as satisfactory results. Because of this, Doman anticipates little trouble in obtaining certification of the Pelican when tests begin in the fall. Company hopes to begin deliveries early next year at a price around $20,000.

Specifications:

Gross weight	3200 lb.
Useful load	1400 lb.
Engine (Franklin)	245 hp.
Normal rotor speed	200 rpm.
Max. speed	85 mph.
Cruising speed (71 percent power)	75 mph.
Normal range	225 mi.
Hovering ceiling (without ground effect)	3300 ft.
Service ceiling (at gross wt.)	14,000 ft.
Main rotor diameter	45 ft.
Tail rotor diameter	8 ft.
Fuselage length	35 ft., 9 in.

Maintenance Meet

The annual airline maintenance conference of the Air Transport Assn. last week was expected to attract the largest attendance of its history to the three-day sessions at the Continental Hotel, Kansas City, Mo. The ten sessions, under the general chairmanship of J. F. Martin, American Airlines, were attended by engineering and maintenance experts from all of the 16 trunklines of the nation.

Agenda for the conference was compiled through questions and answers by the airline maintenance departments and only those questions and subjects receiving the highest votes were placed in the technical sessions. A change in the organization of the conference was made over previous conferences in that each of the main discussion subjects received all-day sessions instead of the half-day system used last year (AVIATION WEEK, Apr. 12, 1948).

Congressional Roundup

Congress has acted rapidly on major military aviation matters, but has shown little interest in civil aviation during the first 60 days of the current session.

Following is the status of key measures:

• **70-Group Air Force** – Authorizing legislation, providing for 24,000 aircraft strength and annual procurement of 5000 planes, has passed the House. Senate is expected to pass the measure shortly. Measure does not carry funds to implement the program.

• **Appropriations** – The 1950 Commerce Department bill, carrying Civil Aeronautics Administration and Civil Aeronautics Board funds, is scheduled to be reported out of House Appropriations Committee by mid-April. Budget Bureau recommended a record $218,008,500 for CAA, $3,980,000 for CAB. Cutbacks in funds for CAA administrative personnel are likely.

Military establishment appropriation bill is also scheduled for release by the House Appropriations Committee by mid-April. Budget Bureau proposed $4,600,000,000 for the Air Force. The committee probably will make cutbacks in funds for USAF administrative activities, but is expected to add $800,000,000 ($435,000,000 for procurement) to boost USAF strength from the 48 groups allowed by Budget Bureau to 57 groups.

• **Radar Network**—Congress has completed action on an authorization for USAF to construct a radar warning network to be operated in conjunction with a similar Canadian network. Estimated cost is $161,750,000: $85,500,000 for land and buildings, $68,250,000 for electronics equipment (USAF already has $42,250,000 on hand), and $7,000,000 for four picket ships.

• **Guided Missile Proving Ground**—A $75 million authorization for USAF to start construction of a guided missile testing ground, with a base area of several hundred miles and an extended range of over 3000 mi., has passed the House. Early Senate approval seems certain. Ultimate cost is estimated at $200 million; cost for the first three years' development, at $70 million.

• **National Science Foundation**—Legislation authorizing establishment of a National Science Foundation to coordinate and promote basic research in national defense and other fields has passed the Senate. Outlook for early House passage appears to be good.

• **Wind Tunnels**—Authorization for a $311 million transonic and supersonic wind tunnel construction program to implement the "unitary plan" worked out by the National Military Establishment and National Advisory Committee for Aeronautics, has been introduced in the Senate by Chairman Millard Tydings (D., Md.) of the Armed Services Committee. An identical bill was previously introduced in the House by Chairman Carl Vinson (D., Ga.) of the Armed Services Committee.

• **Air Reserve** – Several measures increasing the importance of the reserve component in the USAF setup are being pushed. They include: measures, sponsored by Rep. Paul Kilday (D., Tex.) and Robert Sikes (D., Fla.), would create an assistant Secretary of Air for reserve affairs; a measure by Sikes would establish a bureau of reserve affairs in USAF; another by Sikes would authorize an advisory committee to the Secretary of Air on reserve matters; a measure by Rep. James Van Zandt (R., Pa.) would authorize construction of installations for the Air National Guard and the Air Force Reserve.

• **Undersecretary of Defense**—Congress has completed action on legislation authorizing an "alter ego" for the Secretary of Defense. Although lower in rank, the undersecretary will have precedence over the three service secretaries. This was one of the points in the President's proposal for closer unification in the military arm. (John P. Franklin, president of U. S. Lines, has been mentioned for the post.)

• **Military Reorganization**—Legislation carrying out other points in the President's military reorganization proposal has been introduced by Tydings. Outlook for enactment is excellent. Under the Tydings bill; present National Military Establishment would be converted into the Department of Defense; the present authority of the service secretaries to appeal to the President over the head of the Secretary of Defense would be absolved; a "chairman", who would be the nation's top military man and report directly to the President and Secretary of Defense, would be created to preside over the joint chiefs of staff; the Secretary of Defense's control over the Munitions Board and the Research and Development Board would be tightened.

• **CAA, CAB Reorganization**—Legislation authorizing the President to reorganize the executive branch, including CAA and CAB, has passed the House and is pending before the Senate Committee on Expenditures in Executive Departments. Under the measure, the President's reorganization proposals would be subject to veto by a two-thirds vote of the House and Senate within 60 days of submission. Hoover commission has recommended the lumping of all non-regulatory government transportation functions, including the present activities of CAA and NACA, and the safety promulgation activities of CAB, into a transportation service in the Department of Commerce.

• **Airline Investigation** – Senate Rules Committee has approved $50,000 for an investigation of airline finances by the Senate Interstate and Foreign Commerce Committee. Senate approval of the funds will be routine, and Interstate's chairman, Sen. Edwin Johnson (D., Colo.) expects to launch the investigation immediately.

• **Airline Subsidies**—Members of the transportation subcommittee of House Interstate and Foreign Commerce Committee have indicated to Rep. John Kennedy (D., Mass.) that the group will soon take up his bill providing for separation of "subsidy" and "service" mail payments to air carriers. Outlook for enactment is good.

• **Transportation Tax**—Although there is strong support in Congress for reducing the wartime rate of 15 percent to five percent, House Ways and Means Committee's chairman, Rep. Robert Doughton (D., N. C.) has given no indication as to whether his group, now tied up with social security hearings, will give the matter consideration this session. Rep. Joseph Martin (R., Mass.) has predicted they would, along with other excise tax reductions.

• **Airports**—Sen. Pat McCarran (D., Nev.) has introduced eight bills aimed at speeding up the airport construction program by simplifying procedure and easing up on financing. They are endorsed by National Assn. of State Aviation Officials. The $500 million authorized in the 1946 Airport Act, over a period of seven years, will not be used up unless the program is sharply stepped up. It has been kept at a level of approximately $40 million annually since its inception.

Alison to Leave For Industry Post

John R. Alison will leave his post as Assistant Secretary of Commerce for Aeronautics next month to head a new corporation formed to develop interchangeable cargo containers for commercial and military use.

Alison will become president of the Transitvan Corp. of Redwood City, Calif. Transitvan is a subsidiary of the Hodges Research and Development Corp., Redwood City, and the North American Car Corp. of Chicago.

Transitvan will acquire equipment and techniques from the Hodges Corp. for production and handling of half and one-third carload size cargo containers designed for interchangeability between aircraft, ships, rail freight cars, and trucks. A similar plan aimed at cargo packages interchangeable between trucks and air cargo planes was advanced in (AVIATION WEEK, Mar. 21) by George B. Woods, special assistant to Undersecretary of the Air Force Arthur S. Barrows.

Tranitvan is now headed by Fred L. Anderson, retired USAF general who specialized in bombardment during his military career. Anderson is also president of the Hodges Corp. and will become chairman of the Transitvan board when Alison becomes president.

Directors of Transitvan: Wetmore Hodges, chairman of the Hodges Corp. board; William M. Spencer, chairman of the board of North American Car Corp.; Artemus L. Gates, former Undersecretary of the Navy; Allin K. Ingalls, president, Northwestern Refrigerator Line Co.; L. H. S. Roblee, president, North American Car Corp.; Douglas Stuart, vice chairman of the board, Quaker Oats Co.; W. A. Brooks, vice president North American Car Corp.; and Beverly Williams, vice president, Hodges Corp.

Alison, a former USAF colonel and fighter pilot, has been functioning unofficially as Undersecretary of Commerce since the resignation of William Foster from that post. C. V. Whitney, formerly Assistant Secretary of the Air Force, was recently named Undersecretary of Commerce.

PRO, PubRel— All The Same Now

Public relations activities of the Air Force, Navy and Army were abruptly jammed into a single Office of Public Information for the National Military Establishment last week.

The move was aimed at squelching public airing of inter-service rivalry which has recently reached a new peak of intensity in the Air Force-Navy feud over the six-engine Convair B-36B.

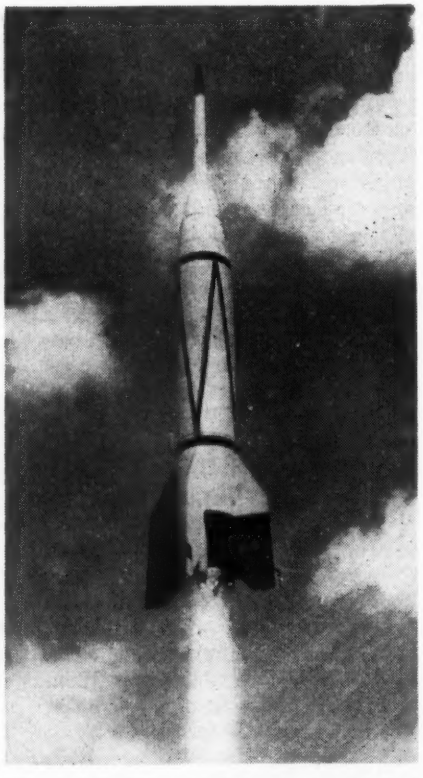
▶ **Frye is Boss**—Under the new setup all public relations activities for the military will be conducted by the new office headed by William Frye, a former Associated Press reporter and more recently Assistant to the Secretary of Defense for Public Relations.

Frye's office will perform the following functions formerly handled by the individual services:

- **Press service** and news room.
- **Security review** and clearance of manuscripts.
- **Radio and television** service.
- **Photograph and newsreel** service.
- **Public contacts** (public relations, civil relations, speakers bureau, presentation teams for public meetings).
- **Accreditation** of correspondents.
- **Clearance**, reproduction, and distribution of all press releases and pictures.
- **Analysis** (clippings, news digests, editorial analysis, information research).

▶ **Advisory Council**—What will become of the sizeable public relations staffs now operated by the respective services has not yet been made clear except that the new public relations directive specifically bars them from performing any of the above functions.

In addition a public relations advisory council was established consisting of Frye and representatives to be appointed by the secretaries of the Air Force, Navy and Army. This council is charged with determining public relation policies to be carried out by the Office of Public Information.



MULTI-STAGE ROCKET FIRED

In the first test of the principle of multi-stage rockets for penetration to extreme altitudes, this WAC Corporal missile mounted in the nose of the familiar V-2 reached an altitude of more than 250 mi., the highest reached by a man-made object. Previous record was only 114 mi., set by V-2 missile alone. At altitude of about 100 mi. and a speed of about 3500 mph., the WAC Corporal in the nose was fired and accelerated to more than 5000 mph. and an altitude beyond the known atmosphere. To date missile has not been found. Composite missile was designed and assembled by General Electric Co., California Institute of Technology and Douglas Aircraft Co. under contract with the Army Ordnance Dept. The multi-stage principle now is being incorporated in production rockets.

Neptunes Are Used In Carrier Tests

Navy is using the Lockheed Neptune (P2V) series of long range patrol bombers as guinea pigs in an experimental program aimed at getting operational data on the use of large multi-engine bombers on aircraft carriers.

Experiments with the P2V series are intended to pave the way for operational use of two new types of carrier based heavy bombers. These two types are the North American AJ-1 powered by two Wasp Major piston engines and an Allison J-33 turbojet, and a swept-wing multi-jet powered bomber still in preliminary design stages. The AJ-1 weighs about 55,000 lb. while the swept-wing jet bomber has a design gross weight of 100,000 lb. Development of this series of bombers is expected to eventually give the Naval air force a striking radius of 2000 mi. from their carrier bases.

▶ **4000 Mi. Mission**—Latest exploit of the Neptune series is a carrier takeoff by a P2V-3C with a gross weight of 74,000 lb., including 10,000 lb. of bombs. This P2V-3C flew 2000 mi. from the carrier, dropped its bomb load and then flew more than 2000 mi. to land at Patuxent River, Md. Naval Air Station. The 74,000 lb. takeoff weight compares with 85,000 lb. for the Truculent Turtle on the takeoff for its record nonstop flight of 11,236 mi. from Perth, Australia, to Columbus, Ohio in 1947. The Turtle carried no bomb load. Aerojet JATO units were used for additional power in both P2V tests.

The P2V performance of more than 4000 mi. in 20 hr. dropping 10,000 lb. of bombs compares with a recent Air Force B-36 mission in which the six-engine bomber carried a similar bomb load for 5000 mi. on a 9600 mi. 43 hr. nonstop mission. Navy has not yet landed a P2V or similar type plane on a carrier deck. Initial use of multi-engine bombers on carrier takeoffs was done with the North American B-25.

PRODUCTION

NAA Profit

Net income for fiscal 1948 nears $7 million after loss in 1947.

North American Aviation Inc. climbed back into the black during its 1948 fiscal year earning net profits of 7 percent of sales in contrast to a net loss for the previous year.

Net profits after payment of $4 million in Federal income taxes were $6,779,561 against a $28,259 net loss for fiscal 1947. North American earned $1.97 per share on its 3,435,033 shares of stock.

▶ **Income Rises**—Total income for the fiscal year ending Sept. 30, 1948 was $94,882,739, an increase of $74,273,748 over 1947. During the same period company backlog increased by $177 million. Change in USAF production plans for North American planes reduced the backlog after the end of the fiscal year to $305 million. North American's current backlog is 99 percent military business involving future production of 1067 military aircraft for the U. S. Air Force and Navy.

During fiscal 1948 North American delivered 227 military aircraft including its entire order of 30 Fury (FJ-1) Navy jet fighters; 3 XB-45 four jet USAF light bombers; and 194 others, including F-86A jet fighters, F-82 night fighters and B-45A bombers. More than half of the year's total deliveries were made in the final quarter.

▶ **More Cash**—Reflecting the generally improved condition of the company during fiscal 1948, North American had working capital of $40,178,687 at the end of the year compared with $36,608,018 and a cash balance of $11,307,020 compared with $5,219,007 the previous year.

North Americans' production program for fiscal 1949 includes 28 AJ-1 Navy attack planes powered by two Pratt & Whitney Wasp Major piston engines and an Allison J-33 turbojet; USAF F-86A jet fighters and the T-28A USAF trainer; and the B-45C powered by General Electric J-47 jet engines rated at 5000 lb. static thrust.

During fiscal 1948 North American expanded its plant space by over a million square feet and increased employment from 16,330 to 22,040. Approximately 2000 production workers were laid off after the USAF production cuts after the end of the fiscal year.

Ryan Report Cites Diversification

Ryan Aeronautical Co., San Diego, reports a sales volume of $7,948,411 for the 12 months ending last Oct 31, and earnings of $356,603 after provision for federal income taxes, for the same period

Company's 1948 fiscal year resulted in a profit equal to approximately 90 cents a share of stock, as compared with a net loss of $127,659 or 31 cents a share, for the 1947 fiscal year. Value of unfilled orders and contracts on hand as of the end of the 1948 fiscal year was $11.7 million.

Analysis of the report to stockholders made by T. Claude Ryan, president, shows that diversified production of commercial and military aircraft and components was responsible for the San Diego firm's good 1948 showing.

Main production was divided as follows:

• **Airplane Division**—Approximately 500 four-place Ryan Navions were manufactured and sold commercially. Production of an additional 163 of these airplanes for the U. S. field forces and National Guard, with spare parts equalling 60 additional planes, was underway at year's end with deliveries to be made over four months. Ryan also had a contract for modification of approximately 35 North American-built Navion L-17A planes for the U. S. field forces.

Substantial progress was reported during the year on development of the Ryan Firebird, a guided missile project under contract with USAF. Tests on the project are being carried on by Ryan engineers at the USAF Guide Missile Test Center, Alamagordo, N. M.

Ryan won a USAF competition for engineering, development and manufacturing of an initial quantity of a high-speed jet pilotless target plane, over 15 other competing entries. Work on this project was started late in the year. An engineering and study contract with U. S. Navy for an advance type airplane design was continued and increased in scope from the previous year.

Production was started on large fuselage tail sections for the Boeing C-97 Stratofreighter and the commercial Model 377 Stratocruiser with first deliveries starting early in fiscal 1949.

▶ **Metal Products Division**—A multimillion dollar subcontract for volume production of stainless steel assemblies for General Electric's J-47 turbojet to be assembled at the newly opened Lockland, Ohio, assembly plant, was the main new business taken on by the Metal Products division. Production of exhaust systems and other stainless steel parts for conventional aircraft engines, and production of rocket power plants and parts are other important activities of this division.

President Ryan forecast that guided missile and jet target plane production would go forward in moderate volume in the 1949 fiscal year, with volume production on jet engine parts, exhaust systems and major aircraft assemblies at a higher rate in 1949. Production of the Navion will be scheduled to conform closely to market trends as they develop during the year.

Plant Leased

Portion of a government-owned aircraft parts plant in Chula Vista, Calif., has been leased for five years to its wartime operator, the Rohr Aircraft Corp., Chula Vista, War Assets Administration announced.

Rent is $5132 monthly in advance. Portion of the plant leased consists of 13 acres of land and improvements, including six buildings with a combined floor space of about 250,000 sq. ft. The property had an acquisition cost to the government of about $1 million.

Rohr Aircraft Corp. will use the property to produce certain military equipment for the Department of the Air Force.

WHO'S WHERE

Bell Aircraft Co., Buffalo, N. Y., has accepted the resignation of David E. Postle as sales manager of the helicopter division. He has been with Bell for two years. While not announcing future plans, Postle saye he will remain in the aviation business.

Consolidated Vultee Aircraft Corp. appointed Harvey C. Tafe manager of the Washington, D. C. office. He has been with Convair since October, 1940. J. P. Shaw was named Washington representative, reporting to Tafe. G. D. Christenson, with Convair since 1938, was appointed manager of the Dayton office, succeeding O. H. Snyder who resigned. Christenson has been assistant chief engineer at Fort Worth, and he will be succeeded in that post by H. W. Hinckley who has been chief project engineer at Fort Worth.

Invitations and Awards to Industry by USAF

Air Materiel Command Procurement Division makes available to AVIATION WEEK the latest bid invitations and awards, shown on this page. Requests for further information should be addressed to Contracting Officer, AMC, Wright-Patterson AFB, Dayton, Ohio, attention: MCPPSX72.

For 10,820 tow targets (49-394):
W. A. Apple Textile Mfg. Co., Dayton, Ohio, on a bid of $364,093.

For an order of photographic paper (49-632):
Companies sharing—E. I. du Pont de Nemours & Co., Wilmington, Del., on a bid of $2807.32; Anken Chemical and Film Corporation, Newton, N. J., on a bid of $3534.

For 25 grinders (49-805):
York Supply Company, Dayton, Ohio, on a bid of $4111.75.

For 5040 lb. of rivets (49-873):
Companies sharing—Aluminum Co. of America, Washington, D. C., on a bid of $3392.87, and Air Associates, Inc., Teterboro, N. J., on a bid of $2857.83.

For 18,500 sq. ft. of sponge rubber (49-908):
Sponge Rubber Products Co., Shelton, Conn., on a bid of $5727.50.

For 43,500 hose clamps (49-911):
Companies sharing—Breeze Corporations, Inc., Newark, N. J., on a bid of $843.26, and Tinnerman Products, Inc., Cleveland, Ohio, on a bid of $1181.60.

For 396,500 lb. of potassium dichromate (49-926):
Companies sharing — Mutual Chemical Company of America, New York, N. Y., on a bid of $11,087.44; E. I. Dupont de Nemours & Co., Grasseli, N. J., on a bid of $2880; Octagon Process, Inc., Brooklyn, N. Y., on a bid of $1080.26, and Blackson Chemical Co., Joliet, Ill., on a bid of $1248.

For 468,000 ft. of braided cotton cord (49-932):
Companies sharing—Small Bros. Mfg. Co., Fall River, Mass., on a bid of $705.24, and Puritan Cordage Mills, Louisville, Ky., on a bid of $2875.

For 41,808 gal. of cellulose nitrate thinner (49-951):
Wood-finishing Products Co., New York, N. Y., on a bid of $26,339.04.

For 29,400 sponges (49-957):
Companies sharing—O-Cel-O, Inc., Buffalo, N. Y., on a bid of $8417.25; Albert Bloch and Sons, Inc., New York, N. Y., on a bid of $148, and Moldex Rubber and Plastics Corp., New York, N. Y., on a bid of $313.50.

For 1239 mechanics' stools (49-1029):
Kewaunee Mfg. Co., Adrian, Mich., on a bid of $11,225.34.

For 733 fuselage cradles (49-1035):
Hammond Mfg. Corp., Huntington Park, Calif., on a bid of $163,274.

For 3730 switches (49-202):
Companies sharing — Ohmite Mfg. Co., Chicago, Ill., on a bid of $710.28; P. R. Mallory & Co., Indianapolis, Ind., on a bid of $425; Cutler-Hammer, Inc., Cincinnati, Ohio, on a bid of $228.40, and Stewart-Warner Corp., Chicago, Ill., on a bid of $12,142.

For 165 transformers (49-213):
Companies sharing — Electronic Transformer Co., Inc., New York, N. Y., on a bid of $2015, and American Transformer Co., Newark, N. J., on a bid of $510.

For 4200 lamp assemblies (49-516):
Companies sharing—Cannon Electric Development Co., Los Angeles, Calif., on a bid of $2489.80, and Marco Industries Co., St. Anaheim, Calif., on a bid of $3288.

For 1642 cable assemblies (49-526):
Companies sharing—Air Associates, Inc., Teterboro, N. J., on a bid of $7213.25; All American Airways, Inc., Wilmington, Del., on a bid of $2575.39; Peerless Tool & Engineering Co., Chicago, Ill., on a bid of $5046.75; Tillston Mfg. Co., Toledo, Ohio, on a bid of $54.60; Franklin Machine Products Co., Inc., New York, N. Y., on a bid of $263.50; Specialty Assembling & Packing Co., Brooklyn, N. Y., on a bid of $796, and Huron Architectural Iron Works, Brooklyn, N. Y., on a bid of $815.60.

For 2150 variable capacitors (49-937):
Companies sharing—Radio Wire Television, Inc., New York, N. Y., on a bid of $351.60; Aerovox Corp., New Bedford, Mass., on a bid of $104.42, and Bendix Aviation Corp., Baltimore, Md., on a bid of $4474.70.

For 55 motors (49-749):
Servo-Tek Products Co., Paterson, N. J., on a bid of $3310.

For 233 radio receivers (49-852):
Hallicrafters Co., Chicago, Ill., on a bid of $43,760.66.

Invitations to Bid

Bid openings are 20-30 days after approximate issue dates shown in the following bid proposals. Bid sets containing specifications for items to be procured will be sent to qualified applicants who state bid invitation number.

One bid set will be available for examination without obligations by prospective bidders, after bid publication date, at each of the seven AMC procurement field offices. This will enable firms to see specifications before writing or telegraphing for their own bid sets.

Procurement field office locations: Boston Army Base, Boston 10, Mass.; Government Aircraft Plant No. 4, Ft. Worth 1, Tex.; 39 S. LaSalle St., Chicago 3; Wright-Patterson AFB, Dayton, Ohio; West Warren and Longo Aves., Detroit 32; 155 W. Washington Blvd., Los Angeles; 67 Broad St., N. Y. 4.

Current bid proposals:

Inverter, 1215 each, bid invitation No. 49-1456, issue date March 14, delivery 200 each month.

Airspeed Indicator, 68 each, bid invitation No. 49-1457, issue date Mar. 14, delivery by May 1.

True Airspeed Indicator, 79 each, bid invitation No. 49-1459, issue date Mar. 14, delivery 20 each month.

Inverter, 328 each, bid invitation No. 49-1460, issue date Mar. 14, delivery 100 each month.

Hydraulic Loader, 40 each, bid invitation No. 49-1461, issue date Mar. 14, delivery 90 days.

Scissors, 1076 each, bid invitation No. 49-1470, issue date Mar. 15, delivery by May 1.

Photographic Equipment, 1-4 items, bid invitation No. 49-1473, issue date Mar. 15, delivery by May 1.

Capacitor, 5920 each, bid invitation No. 49-1436, issue date Mar. 14, delivery best possible.

Cap Air Crew, 5171 each, bid invitation No. 49-1474, issue date Mar. 14, delivery by June 1.

Dehydrating Agent, 110,000 lb., bid invitation No. 49-1471, issue date Mar. 14, delivery 90 days.

Filter Assembly, 60 each, bid invitation No. 49-1466, issue date Mar. 14, delivery by April.

Data for Compasses, 1-5 items, bid invitation No. 49-1477, issue date Mar. 14, delivery best possible.

Compound Liquid Instrument, 4188 each, bid invitation No. 49-1476, issue date Mar. 14, delivery 60 days.

Methylene Choloride, 2000 pt., bid invitation No. 49-1475, issue date Mar. 14, delivery 60 days.

Interlocking Fastener, 7700 each, bid invitation No. 49-1472, issue date Mar. 14, delivery 20 percent monthly.

Plug, 509 each, bid invitation No. 49-1479, issue date Mar. 15, delivery best possible.

Pump, 200 each, bid invitation No. 49-1465, issue date Mar. 14, delivery by May 1.

Liquid Paint Drier, 1-2 items, bid invitation No. 49-1468, issue date Mar. 14, delivery 30 days.

Strapping Steel, 100,000 lb., bid invitation No. 49-1467, issue date Mar. 14, delivery 25 percent monthly.

Test Stand, 15 each, bid invitation No. 49-1464, issue date Mar. 15, delivery by May 31.

Capacitor, 1-8 items, bid invitation No. 49-1480, issue date Mar. 21, delivery by July 15.

Cheesecloth, 50,000 yd., bid invitation No. 49-1482, issue date Mar. 16, delivery 30 days.

Nickel Anode, 1000 lb., bid invitation No. 49-1487, issue date Mar. 21, delivery 30 days.

Mounting Assembly, 1-2 items, bid invitation No. 49-1488, issue date Mar. 21, delivery 5 months.

Photographic Equipment, 1-20 items, bid invitation No. 49-1485, issue date Mar. 21, delivery by July 1.

Valve, 5420 each, bid invitation No. 49-1489, issue date Mar. 21, delivery 1000 each month.

Filter Assembly, 1-3 items, bid invitation No. 49-1490, issue date Mar. 21, delivery as soon as possible.

Filter Assembly, 5420 each, bid invitation No. 49-1490, issue date Mar. 21, delivery as soon as possible.

Resistor, 1-20 items, bid invitation No. 49-1491, issue date Mar. 21, delivery at once.

Capacitor, 1-10 items, bid invitation No. 49-1491, issue date Mar. 21, delivery at July 15.

Adapter, 43 each, bid invitation No. 49-1493, issue date Mar. 21, delivery by June 1.

Cable, 1-6 items, bid invitations No. 49-1494, issue date Mar. 21, delivery by July 15.

Motor, 1-6 items, bid invitation No. 49-1495, issue date Mar. 21, delivery as soon as possible.

Electrical Equipment, 1-5 items, bid invitation No. 49-1496, issue date Mar. 21, delivery 60 days.

Telephone Equipment, 1-5 items, bid invitation No. 49-1497, issue date Mar. 21, delivery as soon as possible.

Photographic Equipment, 1-12 items, bid invitation No. 49-1498, issue date Mar. 21, delivery 30 days.

Stand Assembly, 1-5 items, bid invitation No. 49-1500, issue date Mar. 21, delivery by May. 1.

Photographic Equipment, 1-2 items, bid invitation No. 49-1503, issue date Mar. 21, delivery 60 days.

Tensiometer, 463 each, bid invitation No. 49-1505, issue date Mar. 21, delivery by July 15.

Ohmmeter, 405 each, bid invitation No. 49-1506, issue date Mar. 21, delivery by July 5.

Test Unit Assembly, 1-7 items, bid invitation No. 49-1507, issue date Mar. 21, delivery by June 10.

Oscilloscope, 18 each, bid invitation No. 49-1508, issue date Mar. 21, delivery by June 1.

Tester Fabric, 100 each, bid invitation No. 49-1509, issue date Mar. 21, delivery by June 15.

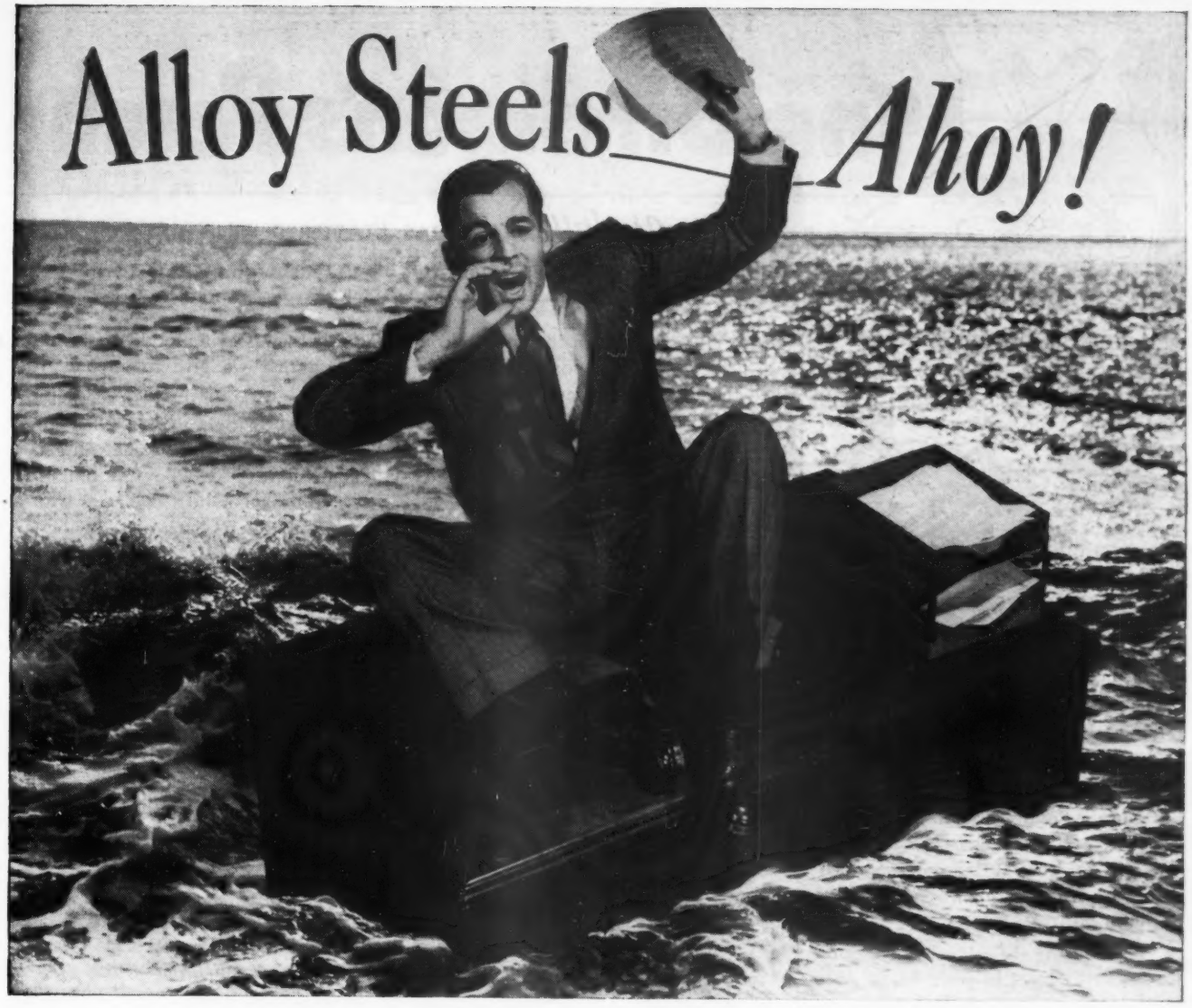
Test Stand, 10 each, bid invitation No. 49-1510, issue date Mar. 21, delivery 90 days.

Tester Assembly, 30 each, bid invitation No. 49-1511, issue date Mar. 21, delivery by June 10.

Focalscope, 20 each, bid invitation No. 49-1512, issue date Mar. 21, delivery by July 12.

Cord, 900 each, bid invitation No. 49-1513, issue date Mar. 22, delivery by May 1.

Alloy Steels Ahoy!



ARE you all at sea about alloy steels? Do you want help in using them? Give Carnegie-Illinois a hail.

We can show you how to keep from going adrift amid the countless types of alloy steels now available, how to chart a safe course in selecting the proper type for any job that requires high service performance and low maintenance costs, how to treat the steel in your shop to get best results in fabrication and in operation.

To find out what the fine alloy steels we produce have to offer you, how they differ one from the other, and why we are in the best position to assist you in their application, send for a copy of our recently published book "U·S·S Carilloy Steels." And when you're ready for specific, practical metallurgical assistance that's based on the latest experience with alloy steels, ask one of our service metallurgists to drop around.

CARNEGIE-ILLINOIS STEEL CORPORATION, PITTSBURGH & CHICAGO
COLUMBIA STEEL COMPANY, SAN FRANCISCO
TENNESSEE COAL, IRON & RAILROAD COMPANY, BIRMINGHAM
UNITED STATES STEEL SUPPLY COMPANY, WAREHOUSE DISTRIBUTORS, COAST TO COAST
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

Carilloy Steels

ELECTRIC FURNACE OR OPEN HEARTH

COMPLETE PRODUCTION FACILITIES IN CHICAGO AND PITTSBURGH

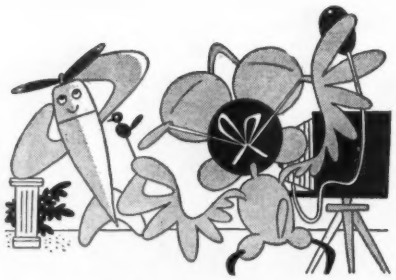
USS

9-514

UNITED STATES STEEL

The Birdmen's Perch

By *Major Al Williams,* ALIAS, "TATTERED WING TIPS,"
Gulf Aviation Products Manager, Gulf Bldg., Pittsburgh 30, Pa.



Hurry, hurry, hurry!

Hurry and write in for your free pictures of the Gulfhawks before it's too late.

One of these great Gulfhawks is already in the Smithsonian Institution . . . the other one takes off from a standing start in less than 2½ seconds, which makes them both unique—so hurry, hurry, hurry!

You can hang these lovely pictures of these lovely planes in your den or over the fireplace . . . you can keep 'em in an album . . . you can show them at the hangar.

But you can't do any of these things until you *get* these pictures. And you can't get them until you write and ask for them! So hurry, hurry, hurry!

Send a post card, a letter, a smoke signal, or a barefoot messenger to the address above, and we'll send the pictures to you with unseemly haste.

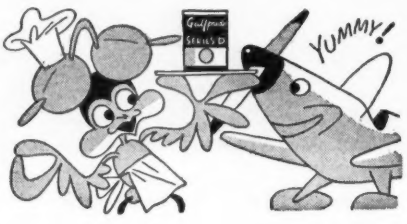
They're free! They're autographed! They're terrific! So hurry, hurry, hurry!

SHORT STORY

This super-lubricant, Gulfpride-Aviation Series D, was tested in the labs and on the fields for 6 years before we were satisfied that it would do everything that a lubricant should do for horizontal engines.

In addition to Alchlor Processing (which removes more of the nonlubricating components from the oil), Gulfpride-Aviation Series D contains detergents which remove foreign matter from engine innards, keep such matter separated and in suspension until it's flushed out at an oil change! This great oil also contains oxidation inhibitors and antifoam agents.

In your engine, that means that you can expect longer periods between overhauls than ever before . . . it means fewer top overhauls and fewer replacement parts



. . . it means that you can practically forget stuck rings or valves!

But don't forget to insist on Gulfpride-Aviation Series D.

LITTLE KNOWN FACTS DEPT.

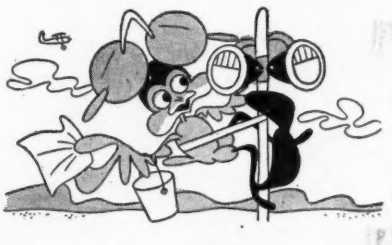
We got a newcomer Perch Pilot who arrived in style!

She (Yep! A genuine female woman of the opposite sex!) sent in a fistful of Little Known Facts About Well Known Planes, *and sent proof with every single one!* Ruth Freckleton was trying for the Senior commission that we give to anyone who sends us 5 Facts that we use.

But we can only use 3 of her Little Known Facts. Of course, she still gets a commission as Perch Pilot (bottom rung) . . . and maybe she'll come up with a couple more items, later on. Like these:

"*The first U.S. Airways beacons were sets of four automobile headlights mounted on poles!*"

"A supersonic plane's cockpit is cooled



by the equivalent of 20 family-size refrigerators!"

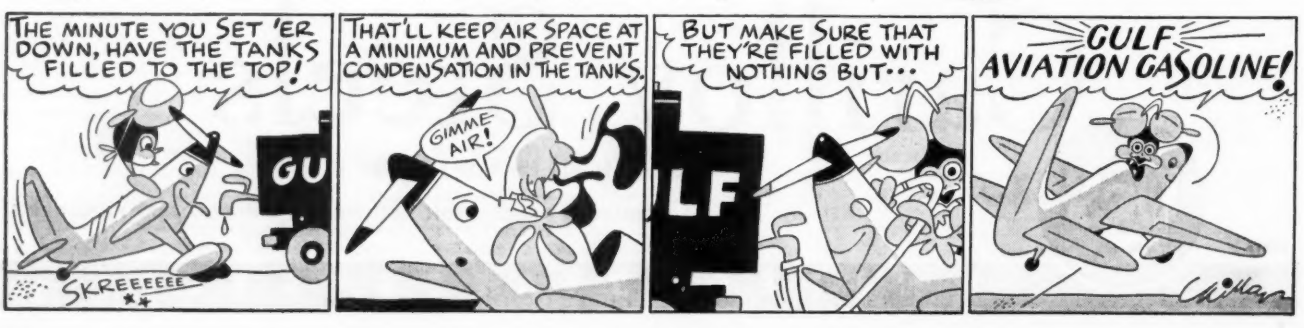
"*61% of all non-airline civilian flying in '47 was done in 2-place, 65 hp-or-less planes!*"

Thankee, Ruth. How about getting some of your students to send us some Facts? Tell 'em a post card'll do.

Just mail them to the address above.

Gulf Oil Corporation and Gulf Refining Company... makers of

GULF **GULF AVIATION PRODUCTS**


THE MINUTE YOU SET 'ER DOWN, HAVE THE TANKS FILLED TO THE TOP!
GU
SKREEEEEE
THAT'LL KEEP AIR SPACE AT A MINIMUM AND PREVENT CONDENSATION IN THE TANKS.
GIMME AIR!
BUT MAKE SURE THAT THEY'RE FILLED WITH NOTHING BUT···
LF
GULF AVIATION GASOLINE!

Bomber Designers Face Range Barriers

Diminishing returns seen with increase of size and weight of craft. Gas turbine offers little aid.

By Ivan H. Driggs *

Changes in the international political scene in the past decade have wrought extensive changes in the strategic mission of U.S. air power, which now places primary emphasis on long-range characteristics. This changing strategic picture is evident in the growing size of bombers of which the B-36 is the latest example.

But engineers are becoming more and more agreed that bigger bombers hold questionable tactical promise, may be very unsound economically and have a low probability of success on a mission because of low cruising speeds.

The reason for this lies in the basic laws of aircraft design, which neither the United States nor a potential aggressor nation can change.

Although individual design teams can produce different values for the terms within these laws, the increasing restrictions on range stem largely from the laws themselves. It can be shown how little effect even substantial changes in these terms have on the final answer obtained.

► **Range Considerations**—Simply, the range of an airplane depends on its average speed and the time it can remain in the air. This can be expressed

$$R = EV \quad (1)$$

and E is determined by the fuel consumption and the amount of fuel carried. Thus,

$$E = W_f/f \quad (2)$$

This fuel consumption is a function of airplane speed and "mileage" obtained from the fuel while in the air, so that

$$f = V/M \quad (3)$$

The mileage, expressed in nautical miles per pound of fuel, may be obtained by rewriting Eq. 3 as

$$M = V/f \quad (4)$$

which equals nautical miles/hour multiplied by hours/pound, and equals nautical miles/pound.

By combining Eqs. 1, 2, and 3, we obtain

$$R = W_f M \quad (5)$$

The speed, V, in knots, may be obtained by the relationship $P = DV/326$, which may be rewritten

$$V = 326P/D \quad (6)$$

Fuel consumption depends on the power being used, propeller efficiency and specific fuel consumption. Thus,

$$f = Pc/\eta \quad (7)$$

Substituting these values in Eq. 4 gives

$$M = 326\eta\, V/DVc = 326\eta/Dc \quad (8)$$

The drag of the airplane may be expressed as

$$D = W_g/(L/D) \quad (9)$$

in which L/D is the lift drag ratio of the airplane, an index to its efficiency.

By substituting Eq. 9 in Eq. 8, we get

$$M = 326(L/D)\,(\eta/c)/W_g \quad (10)$$

Inspection of this equation indicates that the lift-drag ratio must have a high value in order that the greatest range can be obtained. The maximum value of lift-drag ratio is given by:

$$L/D_{max} = .886\sqrt{\frac{r}{C_d}} \quad (11)$$

It is evident that only two airframe factors affect the maximum lift-drag ratio of an airplane—aspect ratio and profile drag coefficient.

Now, if it is assumed that the ratio η/c remains substantially constant throughout the flight, it becomes a simple matter to compute M at a series of weights, including W_g, the full gross weight, and W_e, plane empty weight.

This plot is shown in Fig. 1. Note that mileage increases as the weight of the airplane decreases. This is a result of the decreasing weight acting to decrease the drag, which reduces the power required to maintain the same flight speed.

SYMBOLS FOR THIS ANALYSIS

A_s, area, exposed surface, sq. ft.
c, specific fuel consumption, lb./bhp./hr.
C_{d_o}, profile drag coefficient
D, drag, lb.
dr, density ratio
E, endurance, hr.
f, fuel consumption, lb./hr.
L, lift, lb.
M, mileage, nautical mi./lb.
P, power, bhp.
γ, specific engine weight, lb./hp.
R, range, nautical mi.
r, aspect ratio
S, area, wing, sq. ft.
V, velocity, knots
w, wing loading, lb./sq. ft.
W_e, weight, empty, lb.
W_f, weight, fuel, lb.
W_g, weight, gross, lb.
W_o, weight, oil, lb.
W_p, weight, powerplant, lb.
W_q, weight, fixed equipment, lb.
W_s, weight, structure, lb.
W_{tf}, weight, tanks, fuel, lb.
W_{to}, weight, tanks, oil, lb.
W_u, weight, useful load, lb.
η, propulsive efficiency

Note: All calculations are in nautical miles and knots.

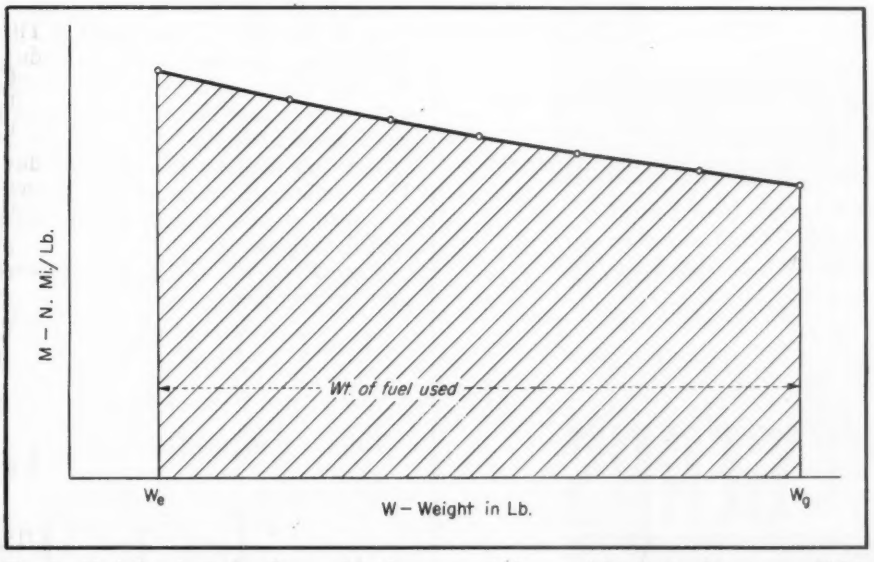
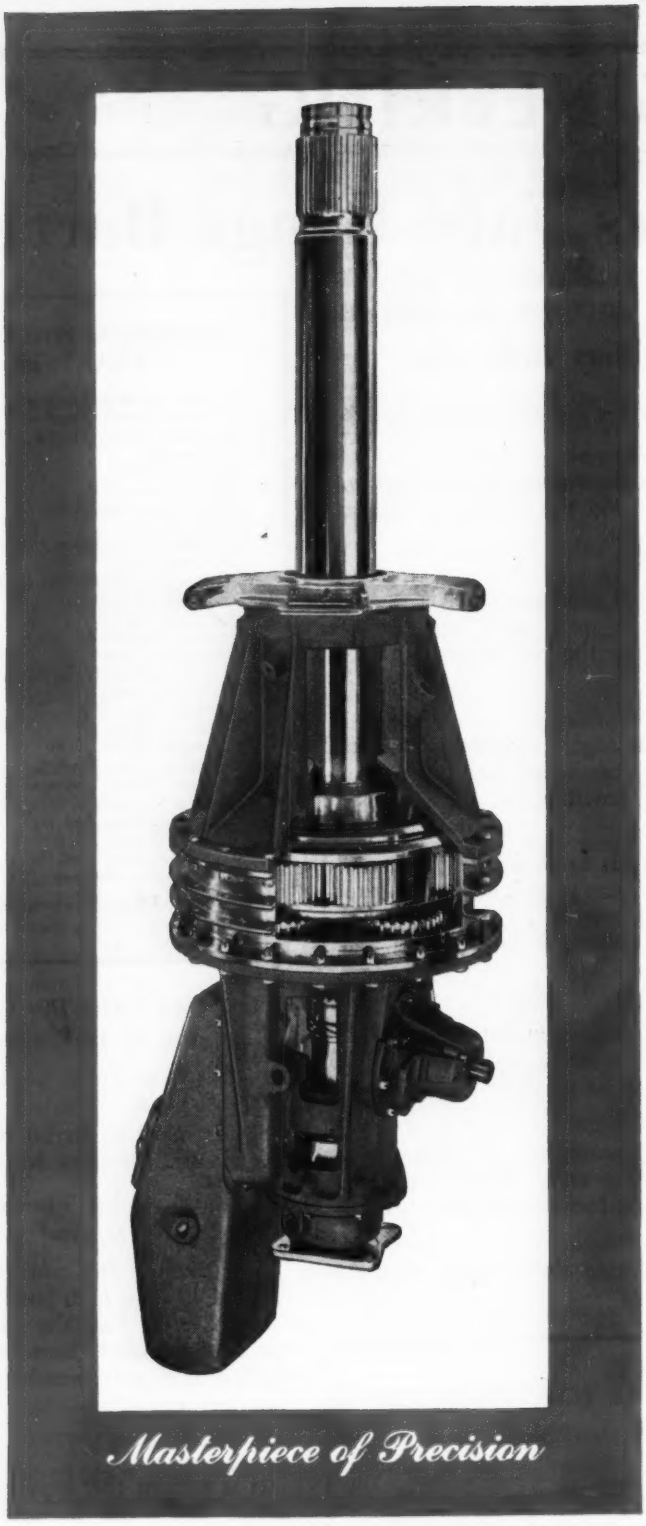


Fig. 1. Variation in fuel mileage with change in airplane weight during long range flight.

* Director, Design Research division, Navy Bureau of Aeronautics.



450 H.P. main gear box of approximately 12 to 1 reduction for the Sikorsky S-51 Helicopter.

Fabricated in its entirety by IGW's skilled craftsmen.

Indiana GEARS

GEARS • CAMS • INTRICATE AND PRECISE MACHINE PARTS

INDIANA GEAR WORKS • INDIANAPOLIS 7, IND.

The difference between W_g and W_e is the weight of fuel expended during flight. Since the range is the product of the amount of fuel used, W_f, and the average mileage in miles per pound, M, the cross-hatched area in Fig. 1 represents the range of the plane.

If the line representing M_{max} (across top of figure) is straight, then average mileage is half the sum of the initial and final mileages. If it is not straight, the mean value will be found by other means, simplest of which is the graphical measurement of the area by a planimeter.

The resulting area divided by the length of the line representing the fuel load (W_e W_g) then gives the average height of the diagram and thus the mean mileage. Another method is to obtain the area by integration (summation of small increments), provided the line is the smooth curve of a function, which it is normally.

By substituting Eq. 10 in Eq. 5,

$$R = 326\left(\frac{\eta}{c}\right)\left(\frac{L}{D}\right)\left(\frac{1}{W_g}\right)F \quad (12)$$

► **Breguet's Formula**—If the weight of the fuel is taken as a derivative of the weight of the plane, dW, and Eq. 12 is integrated from W_g to W_e, we obtain:

$$R = 326\left(\frac{\eta}{c}\right)\left(\frac{L}{D}\right)\int_{W_e}^{W_g}\frac{dW}{W}$$

$$= 326\left(\frac{\eta}{c}\right)\left(\frac{L}{D}\right)(\log_e W_g - \log_e W_e)$$

$$= 326\left(\frac{\eta}{c}\right)\left(\frac{L}{D}\right)\log_e\left(\frac{W_g}{W_e}\right)$$

$$= 750\left(\frac{\eta}{c}\right)\left(\frac{L}{D}\right)\log_{10}\left(\frac{W_g}{W_e}\right) \quad (13)$$

This is the familiar Breguet's range formula and is the algebraic solution for the area represented in Fig. 1. This equation holds true only if the product $\eta/c \times L/D$ is constant throughout the whole flight as in a pure maximum range flight. The more general graphical solution must be employed if this is not the case. Although this product may vary under some circumstances (such as variations in speed and power settings required by the mission), Eq. 13 is sufficiently accurate for first approximations and is very widely used for this purpose.

Since $F = W_g - W_e$, then Eq. 13 may be rewritten

$$R = 750\left(\frac{\eta}{c}\right)\left(\frac{L}{D}\right)\log_{10}\left(1/1 - \frac{W_f}{W_g}\right) \quad (14)$$

This, in turn, may be rearranged as

$$\frac{W_f}{W_g} = 1 - \frac{1}{10^{\left(\frac{R}{750\left(\frac{\eta}{c}\right)\left(\frac{L}{D}\right)}\right)}} \quad (15)$$

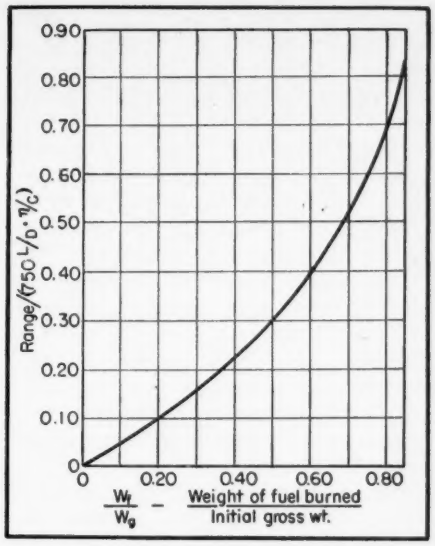


Fig. 2. Solution of Breguet range formula.

This equation gives the amount of fuel required, in terms of percentage of gross weight, to fly a given distance. Fig. 2 gives the results of a series of solutions of this equation.

Using this chart as the graphical solution of Eq. 15, it is possible to make a fairly accurate first estimate of the percentage of gross weight that must be allowed for fuel when the aerodynamic characteristics and the propulsive and engine efficiencies are known.

Eqs. 13 and 15 give no indication of the size or weight of the plane that will result if the range is increased indefinitely; only the ratio of fuel weight to gross weight is given.

It is evident that some limit to this ratio must exist. It can never be 100 percent, since the airplane must weigh something with no fuel aboard; nor can it be zero, since the plane must carry some fuel. The structure, powerplant, useful load and equipment will use up a considerable portion of the total weight. Therefore, before an estimate can be made of how large or heavy an airplane must be for a given range, some estimates must be made of the weight of these items.

► **Weight Factors**—Gross weight of the plane may be assumed to be made up of:

$$W_g = W_s + W_p + W_q + W_u + W_f (1 + W_{tf}/W_f) + W_o (1 + W_{to}/W_o)$$

To express each of these quantities as percentages of the gross weight, we divide through by W_g

$$1 = \frac{W_s}{W_g} + \frac{W_p}{W_g} + \frac{W_q + W_u}{W_g} + \frac{W_f}{W_g} \left(1 + \frac{W_{tf}}{W_f}\right) + \frac{W_o}{W_g}\left(1 + \frac{W_{to}}{W_o}\right)$$

By considering the oil and oil tankage weight as a function of the fuel weight and by rearranging terms, this may be written

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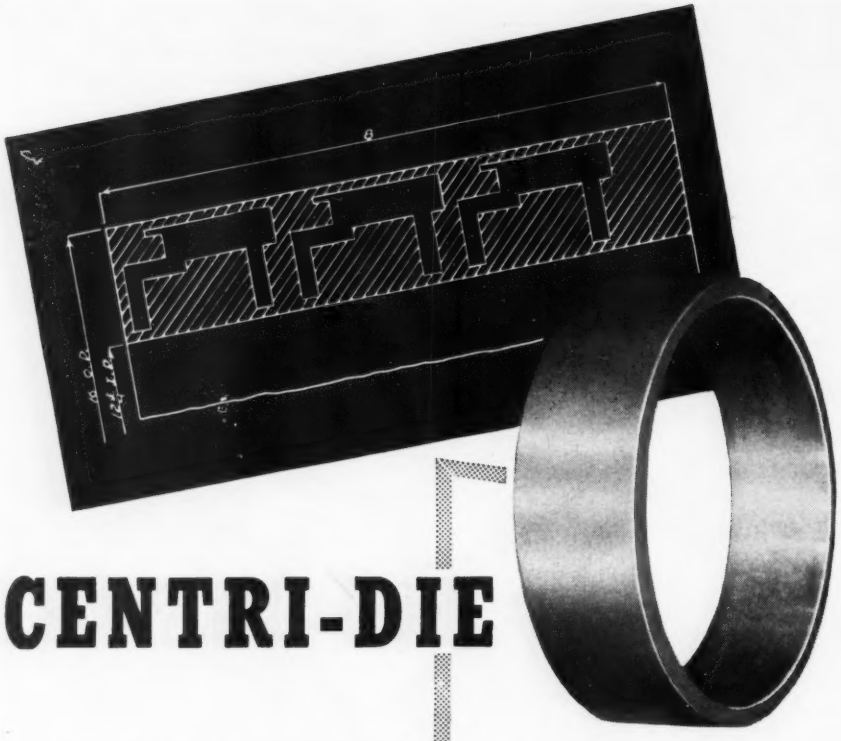

CENTRI-DIE

Illustrated above is a cross section of the metal ring shown in the photograph. Notice how three rings of intricate cross section have been grouped in this one cylinder to conserve metal. By Lebanon's CENTRI-DIE process of centrifugal casting a uniform metal structure is assured throughout each ring as finally machined.

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$$\frac{W_q + W_u}{W_g} = 1 - \left[\frac{W_e}{W_g} + \frac{W_p}{W_g} + \frac{W_f}{W_g}\left(1 + \frac{W_{tf}}{W_f}\right)\left(1 + \frac{W_o + W_{to}}{W_f}\right)\right] \quad (16)$$

Eq. 15 and Fig. 2 give a solution for one of the ratios of Eq. 16, W_f/W_g, and if the others can be evaluated, this formula can be solved. The sum of the equipment, W_q, and useful load, W_u, items is specified by the procuring service for any given airplane design, so that when the ratio allowable for these loads is found from Eq. 16, the gross weight is determined.

The percentage structural weight depends upon a number of factors, which cannot be expressed simply. Design load factor, wing span, wing thickness and fuselage dimensions all affect this ratio. It is probable that the value will lie somewhere between 28 and 35 percent.

Combining Eqs. 6 and 9 gives $P = (W_g V)/(326\ L/D\eta)$, therefore

$$\frac{P}{W_g} = \frac{V}{326\ L/D\eta} \quad (17)$$

Value $p = W_p/P$ may be obtained from the manufacturer's engine specifications. Then

$$\frac{W_p}{W_g} = \frac{Vp}{326\ L/D\eta} \quad (18)$$

Since the least percentage of fuel to gross weight will be obtained when L/D is a maximum, this value may be determined from Eq. 11 and inserted in Eq. 18. The value for the speed at maximum L/D may be expressed algebraically as:

$$V_{L/Dmax} = \frac{12.9\left(\frac{W}{dr}\right)^{1/2}}{(rC_{do})^{1/4}} \quad (19)$$

Substituting Eqs. 11 and 19 into 18 gives

$$\frac{W_p}{W_g} = \frac{.0447p\left(\frac{W}{dr}\right)^{1/2} C_{do}^{1/4}}{\eta r^{3/4}} \quad (20)$$

It will be noted that the value of Eq. 20 depends on the same two airframe items as Eq. 11, namely the aspect ratio and the profile drag coefficient. It also is influenced directly by the wing loading and indirectly by the relative density. This means that an increase in wing loading or an increase in cruising altitude creates an increase in the percentage of power-plant weight to gross weight.

All of the quantities in Eq. 20 are found readily except the value of C_{do}, which must be estimated. As a first approximation, this quantity may be assumed proportional to the total external surface area of the airplane and a "cleanness" factor dependent on the airplane type. This factor varies between 0.003 for very clean jet aircraft to about 0.006 for the conventional

type using air-cooled piston engines. Therefore,

$$C_{do} = 0.003 \text{ (to } 0.006) \, A_s/S. \quad (21)$$

From Eq. 20 an estimate can be made of the power plant percentage weight required to fly an airplane at its speed for maximum L/D, or greatest range. Then, with the ratio of fuel to gross weight determined from Fig. 2 and the structural weight estimated, it is possible to solve Eq. 16. The effect of oil and tankage weight may be accounted for by increasing the fuel percentage 12–15 percent.

It is evident from Eq. 16 that, as the sum of the structural, powerplant and fuel ratios approach unity, the percentage allowable for useful load and equipment approaches zero. Since no airplane is useful without some equipment and useful load, it is evident that such a design is an impracticality. Rewriting Eq. 16 gives

$$W_g = \frac{W_e + W_u}{1 - \left[\frac{W_s}{W_g} + \frac{W_p}{W_g} + \frac{W_f}{W_g}\left(1 + \frac{W_{tf}}{W_f}\right)\left(1 + \frac{W_o + W_{to}}{W_f}\right)\right]} \quad (22)$$

An examination of this mathematical presentation of the statement above demonstrates that as the sum of the structural, powerplant and fuel ratios increase towards unity, the airplane will increase in size very rapidly, finally becoming impossible of attainment without an astronomical gross weight.

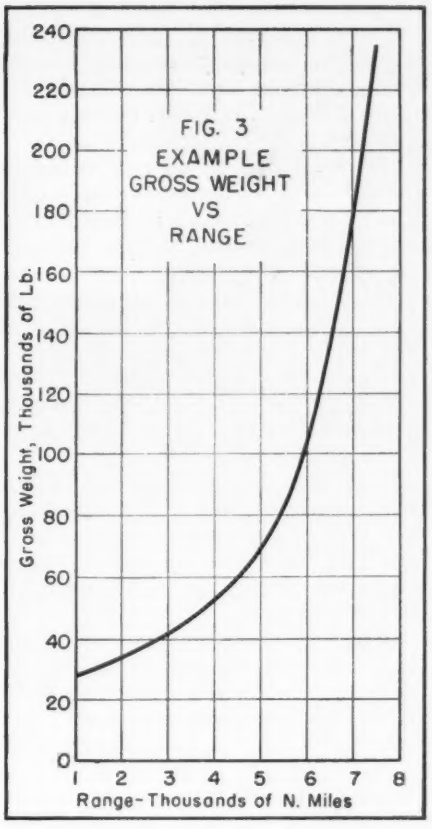
Since, for any given design, the values of W_s/W_g and W_p/W_g will remain substantially constant, Eq. 22 demonstrates the decisive effect the desired range has on the gross weight of the design. Then, as W_f/W_g is increased to meet this range requirement, the gross weight is increased precipitously.

Fig. 3 provides a graphic indication of these effects on airplane size. This figure is based on the reasonable assumptions outlined in the accompanying tabulation. It is evident that when

$$\frac{W_f}{W_g} = 1 - \left(\frac{.30 + .0664}{1.16}\right) = 0.546$$

then the denominator of Eq. 22 equals zero and the gross weight will become infinite, proving the asymptotic nature of the parameter. From Eq. 13, the range is 8640 mi. at this condition. This point cannot be shown on Fig. 3 but the great rapidity with which the gross weight increases as more range is required is demonstrated.

Fig. 3 and the above-mentioned limiting range are not given as a solution for all airplanes nor is it an inference that no better values can be obtained. This example is for illustrative purpose only. However, no matter what values of the various determining quantities are used in the solution, a graph similar to Fig. 3 will be obtained.



Tabulation of Values Assumed In Plotting Fig. 3

$C_{do} = 0.018$

$R = 8.0$

$L/D_{max} = .886\sqrt{\frac{8}{.018}} = 18.65$

$w = 75$ lb./sq. ft.

$p = 2.0$ lb. bhp.

$\eta = .90$

$c = .50$ lb./bhp./hr.

$\frac{W_s}{W_g} = .30$

$dr = 1.00$ (at sea level)

$$\frac{W_p}{W_g} = (0.447 \times 2.0\left(\frac{75}{1.0}\right)^{1/2} \times .018^{3/4})/(.90 \times 8^{3/4}) = (.0447 \times 2.0 \times 8.66 \times .367)/(.90 \times 4.76) = .0664$$

$W_e + W_u = 15{,}000$ lb.

$$\left(1 + \frac{W_{tf}}{W_f}\right)\left(1 + \frac{W_o + W_{to}}{W_f}\right) = 1.16$$

$750\, L/D_{max}\, \eta/c = 750 \times 18.65 \times .90/.50 = 25{,}200$

The absolute relation between range and initial gross weight will change, for better or worse, as the various quantities are changed.

If Fig. 3 is to be improved so that any given equipment and useful weight may be carried a desired distance with reduced initial weight, a whole series of factors must be more favorable than the values assumed in plotting Fig. 3. Each of these factors produces a different effect on range and, although some of them can be improved to a limited extent, in many cases this leads to deterioration in others.

To reduce the gross weight for a given range or, conversely, to increase the range for a given gross weight, it is necessary to:

• *Increase the cleanness of the airplane by reducing the factor for surface drag*–Lowest value for this factor that has been observed in flight test is about 0.003, which applies to very clean jetcraft. This was achieved by using extremely thin wings with a smooth surface finish, but such wings usually involve a weight penalty since thicker skin and heavier spar construction must be used.

The use of turbojets is favorable in reducing the drag coefficient but, unfortunately, the specific fuel consumption is increased by this powerplant, about double that of reciprocating engines.

Efforts towards drag reduction are already being made by the use of internally-mounted antenna (Aviation Week, Nov. 29, 1948), flush canopies, internal rockets, internal JATO units, etc., looking towards achieving these gains both for their increased range and high-speed advantages.

Another method for improving the L/D ratio is to increase the wing area. The induced and parasitic drag are then balanced by reducing the speed at maximum L/D. However, additional weight of the area must be calculated carefully to the point where it just begins to affect fuel weight.

• *Decrease the ratio of total exposed surface area to wing area.*—This can be done by enclosing everything possible within the wing, indicating that the all-wing aircraft (Aviation Week, Dec. 20, 1948) is the most promising configuration for achieving maximum range. However, certain stability and control problems remain to be solved for this type, the present solution being to use an increased wing area, which reduces the gain that might otherwise be anticipated.

• *Increase the aspect ratio of the wing* –An improvement in this factor can be made but at a sacrifice in wing structural weight. An increase in this factor places greater emphasis on the torsional rigidity of the wing. Flutter tendencies of a wing are dependent on the relationship between its bending resistance and torsional rigidity, and consequently the structural weight of the wing may depend more on torsional rigidity in the future than on bending resistance and load factors.

• *Improve the propulsive efficiency*–

It is probable that further developments on propellers will materially change the present conceptions of propeller efficiency at high speed. It is not possible at present to estimate any specific values that may be obtained.

Improvement in the present 85–90 percent limit of efficiency appears unlikely to be exceeded by a very material amount at moderate speeds. At very high forward speeds, however, it is probable that 70 percent may be the limit.

If a turbojet engine is employed, propulsive efficiency can never be more than 50 percent ideally and will probably never exceed 47–48 percent. Nothing whatsoever can ever be done to exceed these values and they demonstrate the future uselessness of turbojet power for very long range.

• *Lower the specific fuel consumption*–It appears that the limit has been reached on present piston engines but by adding weight to the powerplant in the form of exhaust-driven turbines geared back into the engine, a reduction of 20–25 percent has been estimated. However, this requires a material increase in powerplant weight.

The consumption of the turbojet and turboprop units may be decreased by increase in compression ratio, higher operating temperatures, adjustable jet exhaust nozzles and auxiliary devices, all of which, however, increase the powerplant weight.

The two turbine engine types obey laws entirely different from those of piston engines (AVIATION WEEK, Nov. 15, 1948). Specific fuel consumption decreases sharply as the airplane speed increases and decreases more slowly with increase in altitude. From Eq. 19, if the speed for maximum L/D is to increase, either the wing loading must become greater or the flight must be made at high altitude.

A higher loading results in a lower structural weight percentage but from Eq. 20 the ratio of powerplant weight to gross weight must increase, all other factors being equal.

• *Reduce the wing loading*–This will reduce the percentage of powerplant weight from Eq. 20 but will increase the structural weight percentage. This is contrary to the trend necessary for better fuel consumption on turbine engines.

• *Increase the power loading*–Here is the most effective single factor in increasing range, since a 50-percent reduction in the power used can double the range. But this device creates serious performance difficulties and doubling of the power loading would double the takeoff run, cut the speed 30 percent and reduce the rate-of-climb 65 percent, extremely serious penalties to pay.

• *Reduce the ratio of engine power to engine weight*–The present piston engines have reached their lower limit for all practical purposes. The turbojet and turboprop offer considerable improvement in this respect but at a sacrifice in specific fuel consumption.

• *Reduce the percentage of structural weight*–This has been slowly decreasing through the years as improved techniques, materials and analysis methods developed. Only avenue for a substantial gain at the moment, however, is by reducing the design load factor of the airplane but this creates grave risks of failure due to gust loads, which are already indicating the necessity for even increased load factors in large, high-speed aircraft.

The load factor may be reduced temporarily for takeoff by overloading the airplane but maneuvers are severely restricted until enough fuel has been used up to restore the load factor to its design value.

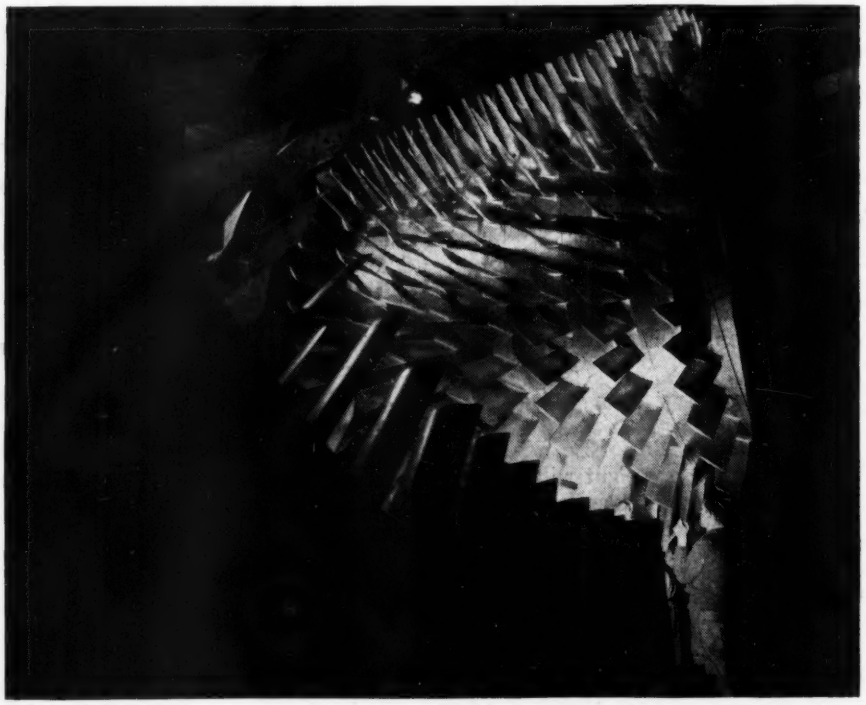
Other solutions are increasing wing thickness, reducing aspect ratio and increasing wing loading but all of these factors have harmful effects on other quantities that should be improved.

As individually promising as each of these approaches to the problem may appear, none equals in importance the selection of the proper airplane dimensions as a means for range increase. All of the previously mentioned gains are isolated by the assumption that everything else about the airplane is held constant while a single parameter is varied. In actual practice, this is impractical.

The individual gains in efficiency, even if they are substantial, have only a minor effect on the range of a given airplane. For example, in a typical aircraft design studied, the ultimate range was increased 1 percent by a 1 percent reduction in specific fuel consumption, or a 2 percent reduction in profile drag or a 1 percent reduction in structural weight.

Most engineers are convinced that a bomber with a 10,000-mi. range is technically feasible. But this result can only be obtained with an airplane which is economically unsound and which has a low probability of success. Too long a time spent over enemy territory reduces the chance of reaching the target and returning home. Too low cruising speeds increase the liability of fighter interceptions.

Actually, the general performance trend is in the opposite direction–towards high performance at a sacrifice in range–and the problem of extending the range of operations will probably be solved only by such means as the use of the aircraft carrier, location of strategic land bases close to the enemy and flight refueling.



SOURCE OF THE BIG WIND

Key component in expansion of wind tunnel research potential of National Advisory Committee for Aeronautics is this mammoth 7-stage, axial flow compressor for 6 x 8-ft. supersonic test facility, world's largest, at Lewis Flight Propulsion Laboratory, Cleveland. Size of installation is indicated by man (lower right) who is locking row of blades on rotor. In foreground is casing carrying stator blades.

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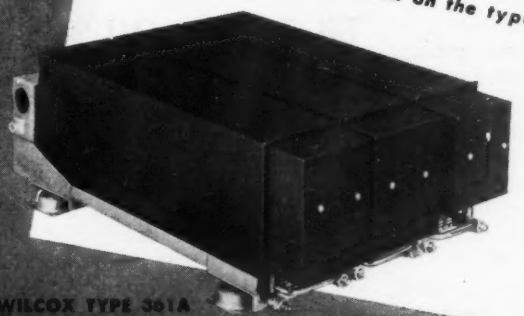

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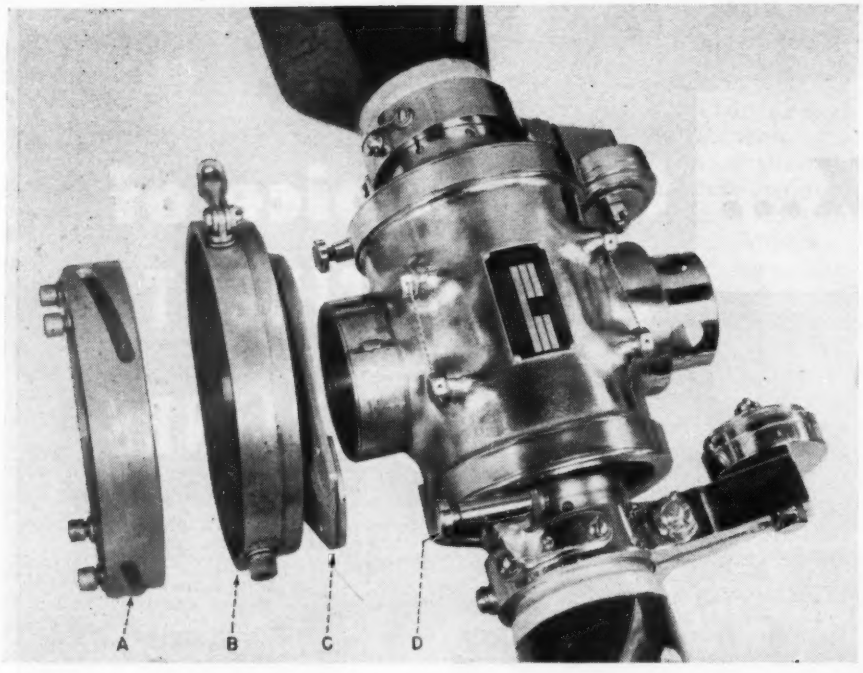

Aeromatic's New Altitude Control

Manually selective device affords infinite number of rpm. settings. Adaptable to standard models of prop.

A simple mechanical linkage supplementing, at the will of the pilot, the automatic operation of the Aeromatic propeller by providing selectivity of engine speed is being fabricated for production models of this airscrew, made by the Propeller Department of Koppers Co., Inc. It may be fitted to all standard models of the prop.

The new manual selective device, designated "Strato-Cruise," consists of two principal parts—a cam guide mounting attached to the engine thrust bearing cover, and a thrust plate housing rotated when pilot operates the cockpit prop control.

When the control knob is pushed in, the thrust plate housing moves forward on the cam guide, engages the propeller blades and rotates them to a selected higher rpm.-position. Pulling the knob out decreases rpm. by withdrawing the control from the prop.

Regardless of the control knob's position, takeoff and initial climb are executed with automatic variable-pitch performance. The propeller will automatically increase pitch until the control is engaged at best climb speed.

During cruise at normal altitude, the automatic operation of the prop may be overridden by the control.

For high altitude cruising, the control may be used to maintain rated rpm. up the airplane's ceiling. Thereafter, the infinite adjustments provided by the control permit most precise cruise settings.

Accompanying photo shows the components of the installation. The mounting flange (A) is fastened to the engine thrust bearing cover by a bracket. Housing (B) is fitted with guide pins that travel in the flange camslots when the housing is rotated by the cockpit linkage.

As the housing moves fore or aft, it carries the thrust plate (C). The latter, mounted on a ball thrust bearing in the housing so that it will rotate with the propeller, incorporates a sleeve with a keyway to mate with the key on the hub boss.

The thrust plate is positioned to contact the counterweight arm thrust bracket (D) attached to the blade. Thus, when the cockpit control is pushed in the high-rpm. direction, the housing rotates and is moved forward carrying the thrust plate forward on the hub boss until it contacts the thrust brackets attached to the propeller counterweights.

When these brackets are pushed forward, the blades are rotated to the high-rpm. position.

A grease fitting is provided on the housing for lubrication of the control assembly.

Cockpit control is equipped with a vernier adjustment providing extremely fine increments of engine rpm.

Movement of the control is transmitted through a covered push-pull tube to a bellcrank to the mounting flange.

The tube carries a maximum load of only 18 lb.

Entire assembly weighs about 11 lb., including control cable and attaching parts.

Canada Sponsors University Tunnel

Canadian Department of National Defense has approved a grant of $350,000 to the University of Toronto for supersonic research. Of this total, $250,000 is to be used for building modifications and the construction of a supersonic wind tunnel capable of Mach 10.

The remaining $100,000 is to be used to cover operating costs over a three-year period.

The tunnel is patterned after the German "Kochel" installation, recently placed in operation by the U. S. Navy at White Oak, Md. It consists of a large sphere from which air is pumped to a near-vacuum. When the tunnel intake is opened, air is drawn through the tunnel and into the sphere.

Although this system restricts tunnel testing time to a matter of seconds, it is extremely economical with respect to power.

Shows Jet Vibrations

Amplitude, velocity and acceleration of vibrations of the General Electric TG-190 turbojet in flight are being analyzed with the aid of an instrument mounted on the control panel.

This meter, developed at GE's general engineering and consulting laboratory, Schenectady, N. Y., is capable of measuring up to 300 vibrations per sec. Its detector is a small cylinder which converts engine vibrations into electrical impulses.

In tests, several of the detectors are mounted at engine locations where vibration is most critical. The electrical impulses obtained are amplified and registered on the panel instrument.

High-Heat Oil Tank

A new type oil tank, designed to afford greatly increased safety from fire hazards—particularly in operation of combat aircraft—has been developed by the B. F. Goodrich Co., Akron, Ohio, for the U. S. Navy.

Reported to be the first of its kind, the flame-resistant container has an outer shell of synthetic rubber combined with other materials and is capable of withstanding a heat of 2000 F. It is also bullet-sealing.

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Oil Cooler Has Novel Tube Joint

Mechanical attachment of core elements permits tube change without removal of cooler from aircraft.

The all-aluminum engine oil cooler has made its place in aviation industry as a lightweight and practical accessory for oil temperature regulation.

Two major manufacturers of the aluminum type of cooler are the Clifford Mfg. Co., Waltham, Mass., and the AiResearch Mfg. Co., Los Angeles.

The Clifford unit exemplifies the standard method of radiator core construction in that the tubes are brazed together. However, a patented process of aluminum-alloy brazing was originated by this company and affords an extremely light core of unusual strength and resistance to vibration.

This cooler has been selected by the U. S. Air Force for installation in several military aircraft. Foreign manufacturers also have chosen it for use on some of their latest planes.

AiResearch has, on the other hand, developed a mechanical joint method of manufacturing the cores which is novel in the field of radiator construction. Instead of the core tubes being brazed, a seal is effected between the tubes and header plates by a swaging process.

Many advantages to an airline operator ensue from the application of this method, although the original cost of the equipment is generally higher than that of competitive units.

For example, leaking tubes may be removed and replaced individually with a minimum amount of difficulty, thus avoiding the plugging of tubes, which eventually impairs the performance of the unit.

Particularly interesting from a maintenance point of view is that no special equipment is required to perform this work other than a simple repair kit supplied by the manufacturer. Moreover, tubes may be changed without removing the cooler from the plane, saving an appreciable amount of time and effort and allowing repairs to be made at line stations with limited overhaul facilities.

Also important is the fact that metal chips, which tend to accumulate in oil coolers after engine failure, are readily flushed away through the removal of a few tubes, thus permitting the salvage of the assembly—obviously an important economic consideration.

Absence of brazing flux eliminates the possibility of corrosion from incomplete flux removal. And the cores have exhibited great resistance to collapsing pressure, large units having withstood over 300 psi. without tube failure.

The AiResearch oil cooler is standard equipment on most major postwar commercial transports.

Emergency Impulse Generator

Developed for aircraft use, impulse generator designed by **Specialties, Inc.**, Syosset, L. I., N. Y., is applicable in many emergencies where normal power or alarm circuits are cut or destroyed. Example of use is for detonating explosive charges to jettison cabin doors, escape hatches, etc. Power is provided by dual-spring motor which drives generator three revolutions before release by an automatic clutch. Either half of motor can furnish adequate power for generator operation. Unit is actuated by flipping aside guard cover and striking trip knob. For re-use, same knob serves to rewind spring motor and position signal flag, indicating that mechanism is fully wound and ready.

Rate, Position Gyros

Telemetering rate gyros calibrated for rotational measurements from 10 to 1000 deg. per sec. and position gyros with one and two axis electrical sensory elements are announced by **G. M. Giannini Co., Inc.** 254 West Colorado, Pasadena 1, Calif. Gyro accuracies of better than 2 percent are offered and production units have been standardized with 2000, 2500, and 5000-ohm resistance pick-offs. Other resistance ranges are also available. Rate gyros offer natural frequencies to 40 cps. and are available damped or undamped.

For Runway Maintenance

Asphalt expansion joints on airport runways may be excavated by rotary cleaner made by **San Jose Pipe & Tank Co.**, 1596 W. San Carlos St., San Jose, Calif., to permit low-cost maintenance of smooth surface. Device is powered by 4-hp. Wisconsin engine for one-man operation, has speed of about 1,500 linear ft. per hr. Exchangeable, 2300-rpm., carbide-tipped cutter accommodates joints from $\frac{3}{8}$ to $1\frac{3}{4}$ in. wide, $1\frac{1}{8}$ in. deep. Counterclockwise motion of cutter head tends to pull machine for ease of operation. Asphalt is accommodated in adequate pickup unit. Machine has depth-control wheel.

Affords Drafting Ease

Draftsman's chair made by **Cramer Posture Chair Co., Inc.**, 1205 Charlotte St., Kansas City 6, Mo., has seat which may be height-adjusted easily, without tools, from $23\frac{1}{2}$ to $32\frac{1}{2}$ in. Seat depth may be adjusted via simple handwheel, similar adjustment is provided for height of back, and footrest is independently raised and lowered. Seat is also provided with forward-tilting mechanism, so that as draftsman leans forward to work on upper part of drawing board, tilting device permits seat and back to follow his motions.

How STAINLESS STEEL helps insure passenger comfort in the Navy's Lockheed Constitution

Shown here is the Constitution's commodious main deck which seats 92 passengers. The lower deck can accommodate 76 passengers or can be used for cargo. Cabin heat is provided from the engine exhaust system through the Stainless Steel tube and bleed ducts shown above.

IN this giant long-range transport plane, the first ever designed and built to Navy specifications, no effort has been spared to make high altitude flying pleasant and comfortable.

Both upper and lower passenger decks of the Constitution are provided with strategically placed air outlets through which cabin is pressurized to maintain 10,000 ft. atmospheric conditions even at 25,000 ft. Air flow diffused through "anemostat" units provides draftless circulation.

The tube which carries the heat from the engine exhaust system throughout the length of the cabin, and the bleed ducts that serve the heat exchangers that control cabin air, are made of U·S·S Stainless Steel. This construction provides light weight plus high creep strength at elevated temperatures, offers high resistance to corrosion and vibration fatigue, and thus insures long-lasting and trouble-free performance of the heating system.

With U·S·S Stainless 18-8S the makers of exhaust systems, venturi cowlings, aircraft boilers, heat exchangers and jet engine burner assemblies are consistently obtaining superior service. In structural parts and control surfaces too, U·S·S Stainless Steel will out-perform other materials. Fast fabrication by spot welding—20 to 100 times faster than riveting—lowers assembly costs.

Why not take advantage of the many benefits this versatile, *service-tested* steel has to offer. Our engineers will gladly assist you in applying it most economically and efficiently to your designs.

AMERICAN STEEL & WIRE COMPANY, GENERAL OFFICES: CLEVELAND, OHIO · CARNEGIE-ILLINOIS STEEL CORPORATION, PITTSBURGH & CHICAGO
COLUMBIA STEEL COMPANY, SAN FRANCISCO · NATIONAL TUBE COMPANY, PITTSBURGH · TENNESSEE COAL, IRON & RAILROAD COMPANY, BIRMINGHAM
UNITED STATES STEEL SUPPLY COMPANY, WAREHOUSE DISTRIBUTORS, COAST-TO-COAST · UNITED STATES STEEL EXPORT COMPANY, NEW YORK

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U·S·S STAINLESS STEEL

SHEETS · STRIP · PLATES · BARS · BILLETS · PIPE · TUBES · WIRE · SPECIAL SECTIONS

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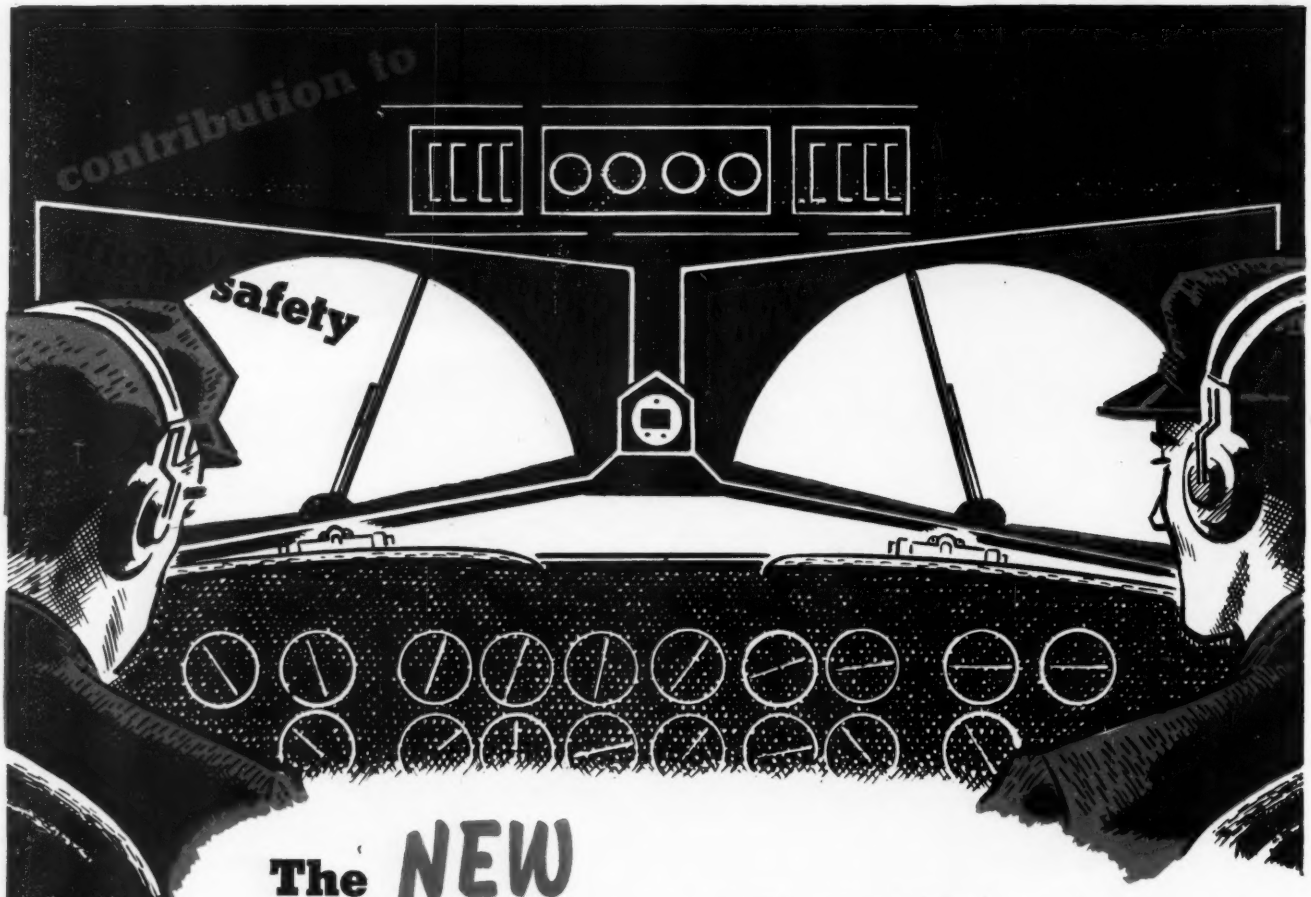
UNITED STATES STEEL



The NEW Marquette Model 3V Wiper

This new windshield wiper incorporates every feature that is desirable and practical, based on thousands of installations on military, naval and commercial aircraft. It is the result of more than ten years of experience in this highly specialized field.

Blades are synchronized at all times. • Obstruction in path of blade will not stall it. Blades may wipe in same or opposed direction. • Blades are parked and locked when wiper is not in use. • Universal drive arm and tie rod require minimum stock of parts. • Wiper blades are easily replaced. • Pressure is removed from system when not in operation. • Motor unit may be located at any position in the airplane. Stroke on each window can be varied. • Hydraulic tubing eliminates linkage control and provides additional space for mounting other instruments. • Motor unit and window units are universal, providing maximum interchangeability of parts. • Constant torque values through entire stroke. • Uniform stroke at all speeds. Simplicity of design, resulting in lower first cost and reduced maintenance expense.

The Marquette METAL PRODUCTS CO.

CLEVELAND 10, OHIO

SUBSIDIARY OF CURTISS-WRIGHT CORPORATION

Manufacturers of: HYDRAULIC, ELECTRIC AND AIR PRESSURE WINDSHIELD WIPERS
HYDRAULIC GOVERNORS FOR DIESEL ENGINES • ROLLER BEARING TEXTILE SPINDLES
FUEL OIL PUMPS • AIR COMPRESSORS • PRECISION PARTS AND ASSEMBLIES

FINANCIAL

CAB Gives Itself More Problems

Its policy statement tells what should be done, but leaves unanswered the big question of how.

In a full measure of orders, the Civil Aeronautics Board recently created a regulatory atmosphere which carried messages of hope for some airlines and fears for others.

The near-term implications were that carriers badly in need of help would have their credit positions bolstered by temporary mail relief payments. While the promise of closer cooperation with the Reconstruction Finance Corp. and the Bureau of the Budget heralded a more liberal loan policy toward the airlines, the exact pattern for such help is yet to be disclosed.

A key feature of the Board's rate action was the reversal of last year's decision not to absorb losses due to the grounding of aircraft. In establishing the principle that such costs are now reimbursable through the mail rate, CAB fixed a tentative amount of $2-million each for American, United and TWA.

▶ **Disparities**—It is obvious, however, that many disparities exist in this uniform determination and adjustments must surely follow. For example, American had a larger number of DC-6s in service than United at the time of the grounding. Traffic demands were higher when TWA's Constellations were inoperative due to mechanical modifications. How are these factors to be reconciled? Is a profit going to be allowed on traffic that would have been carried on these grounded planes had they been in service?

These are but a few of the problems involved. Yet, this phase is very simple compared to the determinations faced in other directions by the Board as a result of its own actions.

▶ **Route Studies**—Various route segments where traffic does not appear to support existing carriers are slated for a full investigation so that proper adjustments may be made.

The key segments involved are Chicago-Washington now served by Capital, American, TWA and American; Washington-Detroit-Twin Cities operated by Capital and Northwest; and New York-Detroit flown by Capital, United, American and Northwest.

Important as these studies are, they must be viewed in relation to the other investigations launched by the Board as well as appraised in the light of continuing regulatory policies.

A major investigation will inquire as to the reasons for the differences in mail pay requirements among the "Big Four" and to determine to what extent these differences may be due to uneconomical and inefficient management and to explore remedial action to be taken by the Board or the carriers to eliminate or decrease dependence upon "need" mail payments.

Other surveys will examine the cost of the domestic trunk lines of transporting the mail and the factors which determine the fair rate of return on the investment.

▶ **Carrier Surveys**—Western Airlines and Northeast are both slated for an examination as to how they may best be integrated with the rest of the air transport industry. The order on Western is noteworthy as the possibility of suspending its certificate is raised, whereas this is not an issue for Northeast.

These and other investigations launched by the Board are very ambitious undertakings. It is believed that major phases of these surveys have previously been attempted by the Board without conclusive action. The carrying forward of all of these projects at this time will impose a tremendous burden on a staff now under continuing pressures from routine proceedings.

Further, all of the carriers touched by these investigations are required to prepare and submit extensive materials in answer to detailed queries requested by the Board. For the most part, such data is stipulated for submission within 60 days after Feb. 21, 1949, the date of the issuance of the orders. The preparation of such information will represent a costly and time-consuming operation extending well beyond the period specified.

This phase has its ironic aspects in that Eastern and American, which received no temporary mail pay relief, are penalized in the added costs that they now will be forced to absorb in compiling materials which, in effect, are expected to show the reasons why they do not need the same measure of help found necessary for others in the "Big Four."

▶ **Contradictory Forces**—The line of inquiries being pursued by the Board definitely point to a desire of recasting the air route pattern of the nation. Yet, contradictory forces are set in motion by awarding adequate "need" mail payments to all carriers who are candidates for "adjustment."

No airline management which is kept alive by relief mail pay is going to be induced to accept reasonable merger terms, to say nothing of being motivated to make a real drive toward greater cost consciousness. This in itself prolongs the status quo of the air transport industry and makes subsequent changes that much more difficult.

An investigation as to the desirability of dismembering National was announced many months ago. Thus far, very little of a conclusive nature has resulted from this inquiry. With the issues in the Western and Northeast cases more clearly defined, it is probable that these proceedings will be greatly expedited.

▶ **Slow Action**—With this background appraisal, it would be a mistake to anticipate immediate action on any far-sweeping changes in the composition of the airline map.

Recent moves definitely indicate, however, a greater trend toward increased government participation in airline affairs. While such aid in the form of increased mail pay and loans may prove very welcome to the carriers concerned, it is surrounded with undesirable aspects in that the industry will have a tenuous hold on the right to demand greater freedom in the conduct of its operations.

It is significant that while Eastern and American appear to have been neglected and, in fact, even penalized by recent Board regulatory actions, actually they may be the main beneficiaries in the final analysis. Most definitely they will be in the best possible position to resist government intervention in the conduct of their operations. Reduced to practicable measures this means that remaining on strictly a "service" mail rate, Eastern and American may be entitled to develop sufficient earnings without any particular fear of having the rate of return on the investment reduced through a cut in mail payments.

—Selig Altschul

Stock Tranactions

Recent stock transactions, as reported to the Securities and Exchange Commission, include:

● In a significant purchase, J. S. Ogsbury acquired 10,000 shares of Fairchild Camera and Instrument Corp., in January, augmenting his ownership to 11,845 shares.

● P. E. Collins continues liquidation of his holdings in Northeast Airlines, selling 1000 shares in January, leaving 5000.

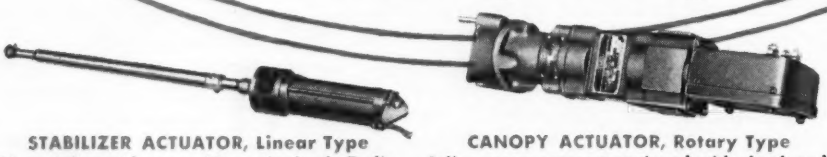
● R. W. Millar sold 600 shares of Northrop, retaining 3500 at the end of January. A. J. W. Myers sold 600 of the same company stock, holding 1400.

Need Power in a Small Package?

put it up to EEMCO

Just as during the war, EEMCO has continued on into peacetime its concentration on serving the aircraft industry... performing a specialized design, development, engineering and manufacturing service. Leading aircraft builders have asked us to contribute to some of the most important aircraft of the last decade, and to many more now under development. EEMCO-built motors and actuators have solved the very toughest problems of function, power, size, weight, shape, performance, installation and operation. Let EEMCO tackle *your* problem.

Actuators and Motors like these ...of difficult and unusual design... are our specialty



STABILIZER ACTUATOR, Linear Type
Motor inline with screw. Magnetic clutch. Radio noise suppressors. Travel limit switches. Weight, 14 lbs. Normal load, 2500 lbs. Rate of travel, half-inch per second.

CANOPY ACTUATOR, Rotary Type
Inline rotary actuator equipped with clutch and brake. Radio noise filter. Designed to meet an exacting space requirement.

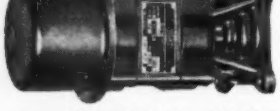
STABILIZER ACTUATOR, Linear Type
Magnetic clutch, radio noise suppressors. Normal load 2500 lbs. Maximum load, 8,000, static, 20,000 lbs. Stroke 7-1/2 in. Rate of travel, .62 inches per second. Weight, 17 lbs. Non-jamming end stops.

STANDBY MOTOR FOR WING FLAP ACTUATOR
Equipped with radio noise filter, magnetic clutch and brake. Brake torque, 30 inch-pounds.

VARI-CAM ROTARY ACTUATOR
Magnetic clutch and brake. Overload torque limiter. Provision for manual operation.

HYDRAULIC PUMP DRIVE MOTOR
Open through ventilated for continuous duty. 3-3/4 H. P. continuous. Equipped with radio noise filter and integral gear reduction . . . Weight, 23-3/4 lbs.

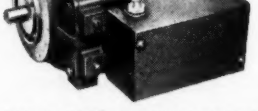
EXPLOSION PROOF AILERON BOOSTER MOTOR
Explosion proof, continuous duty. 1-1/2 H. P. continuous duty rating. Peak intermittent duty rating, 2.7 H.P.



AILERON BOOSTER MOTOR
Open through ventilated for continuous duty operation. Integral gear reduction. Weight, 12 lbs. 2 H. P. continuous rating.

2-SPEED AZIMUTH MOTOR FOR RADAR SCANNER
Two-speed reversible. 3,000 R.P.M., 12,000 R. P. M. Double winding to give close speed regulation at both speeds.

PILOT SEAT ACTUATOR MOTOR AND CLUTCH
30 second duty cycle, 1/2 minute out of 10 minutes at 95 watts output. Weight, 18 oz. Specifications can be varied to suit special conditions.



WATER INJECTOR PUMP MOTOR
4.15 H. P. Duty cycle, 3 minutes full load, 3 minutes no load. Explosion-proof. Equipped with radio noise filter and integral gear reduction.

TELL US YOUR REQUIREMENTS
Check with us on a current motor or actuator design problem.
Give us the following preliminary data:
Type of unit • Specific function • Special requirements • Operating conditions • Motor and actuator specifications
Any available drawings, diagrams, and tables should be provided.

ELECTRICAL ENGINEERING and MFG. Corp.

EEMCO

4606 W. Jefferson Blvd., Los Angeles 16, California

Bill Odom talks over his record flight with employers, Walter Beech (left) and Mrs. Beech.

Odom to Stump for Lightplanes

Beech Aircraft Corp. will send pilot around country in attempt to sell the public on personal aircraft.

Beech Aircraft Corp. is losing no time capitalizing on Bill Odom's Honolulu-Teterboro flight to impress businessmen with potential of the personal-type aircraft.

The company plans immediately to send the pilot around the country as an "ambassador" for the lightplane industry in a campaign to sell the public—particularly businessmen—on the personal aircraft's utility, dependability, and low cost operation.

Shortly after his record-breaking flight, Odom flew out to Wichita to map strategy with Beech officials. He will give lectures, arranged in advance by local Beech distributors, to various clubs and business groups in most of the nation's key cities. The pilot has indicated that he will work for Beech in this or a similar capacity for at least a year.

▶ **Not First**—Beech's idea of using a pilot who has demonstrated the capabilities of the company's plane to stump for the private plane industry is not new.

Piper Aircraft Co. has a similar arrangement with George Truman who piloted one of the two Piper Super Cruisers in the first lightplane flight around the world in 1947.

Truman has been on a sales-promotion tour for Piper since early this winter and already has spoken before Rotary clubs, church groups, etc., in Florida, Georgia, South Carolina, Delaware, and Pennsylvania.

Major difference between Truman's tour and the one Odom will make is that Truman has been lecturing mostly to small groups in small towns, while Odom will concentrate on large audiences in the cities, with special emphasis on business groups.

▶ **Flight Increased Inquiries**—According to some Beech distributors, there has been a notable increase in the number of inquiries about the Bonanza since the record-breaking flight.

One of the most important ways in which the flight served the lightplane industry was that it brought to the businessman's attention in a spectacular way the relatively low-cost of operating an executive type personal craft. Gas for the 5000-mi. trip cost only $75.

Odom used 272 gal. for the flight and landed in Teterboro with a little over 15 gal. in his tanks (AVIATION WEEK, Mar. 14).

There would have been even less if the fuel had not been chilled to increase its density before filling. This measure was suggested and handled by Shell Oil Co., who also increased the fuel supply in this manner for Odom's first attempt earlier this winter.

▶ **Fuel Estimated**—As he had no fuel gauges on the 62-gal. wingtip tanks, the pilot had to estimate his fuel consumption during the trip by power settings.

Considerable weight saving was gained by reducing the Bonanza's oil capacity to one-third of that provided for the first flight—from 12 gal. to 4½ gal. Only four quarts of oil were used for the entire trip.

Two important items which Odom carried on the first flight but left behind to save weight on his second attempt were celestial navigation equipment and the Gibson Girl emergency rescue transmitter.

All navigation was carried out with Lear radio equipment. A Gibson Girl was to be dropped by escort craft if the pilot was forced down in the water.

Besides the work he will do for Beech, Odom plans to set up a business plane maintenance service at Teterboro.

Record Status

Confirmation was received last week by NAA from the Paris FAI office of world record status of William Odom's earlier Bonanza flight of 2406.9 mi. from Honolulu to Oakland. Two Italian flyers (AVIATION WEEK, June 14, 1948) were credited with a slightly longer flight of 2600 mi. from Campoformido airfield, Udine, to Massawa, Eritrea, in a 130 hp. three-place Grifo monoplane, but their flight apparently has not been officially recognized.

Official distance of second Odom flight is reported by NAA as 4957.24 mi. This is expected to establish a new official international distance record for lightplanes and for no-stop solo flights in all categories. Record was in FAI's third category for light airplanes, those weighing from 2204.7-3858 lb.

Nassau Record

Private planes in increasing number are making the over-water hop from the U. S. to Nassau, Bahamas.

Nassau development board reports that a new record was set when 40 personal craft—mostly from Miami—landed at Oakes Field in February.

Total aircraft, including scheduled carriers, handled at Oakes in February reached 1192, another record.

This winter, three out of four visitors to Nassau have traveled by air. Last year two-thirds went by plane.

Custom Built

MOTORS, ACTUATORS

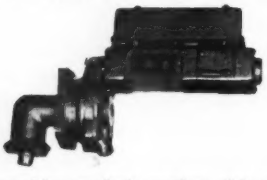
for YOUR design requirements

COMPLETE PACKAGED POWER UNITS FOR EVERY AIRCRAFT APPLICATION

FOR almost a decade, Hoover-designed actuators have been specified on the highest performance aircraft. Today, they are meeting the severest load and operating requirements on the most advanced military planes in production and service.

All Hoover actuators contribute to airframe manufacturing economy because they are designed for quick installation on the assembly line.

Designed for in-flight adjustment of the horizontal stabilizer of a jet fighter, this actuator, weighing 12.5 pounds, will withstand an ultimate load of 15,000 pounds without failure.



For positive cockpit sealing, this power unit utilizes a unique torque limiting clutch, with no frictional parts, the load being transmitted by spring loaded rollers. It has operated 5,000 consecutive times with a maximum variation in torque of 15% from specified value.

To regulate pressurization on a heavy bomber, this actuator is controlled by a direct pressure measuring device through a potentiometer. It includes a 9360 to 1 triple planetary gear reduction, with 500 inch-pounds normal load rating and the motor shaft can be braked so sharply that travel of the output shaft is limited to ½ degree.

Consult Hoover Electric Company for:

SPECIAL MOTORS • SPECIAL GEARING COMPLETE POWER PACKAGE UNITS

For A.C. or D.C. power source with magnetic clutches and brakes, built in limit switches, potentiometers, thermal overload relays, radio noise filters, pressure tight shaft seals, with linear or rotating power takeoff.

Experimental or Production Quantities

HOOVER ELECTRIC COMPANY

2100 South Stoner Avenue
Los Angeles 25, California

BRIEFING FOR DEALERS & DISTRIBUTORS

PLANE-O-TEL—Southwest Airmotive Co. is building an "Executive Plane-O-Tel," adding storage facilities for 10 twin-engine executive planes or 20 single-engine craft, at Love Field, Dallas. The 400-ft. by 40-ft. all-metal structure is expected to be completed June 1.

BRAYTON DEGREE—Brayton Flying Service, Inc., at Lambert Field, St. Louis, has been authorized by Missouri secretary of state to confer degree of Bachelor of Science in Aeronautical Engineering upon graduates of the two-year Brayton course. Graduates are required to pass tests for CAA airplane and engine mechanics license and private pilot license, in addition to their engineering studies, which include design, construction, aerodynamics and materials strength.

OVERHAUL CONTRACTS—Airwork Corp., Millville, N. J., has been awarded contract for engine overhauls for All American Airways for the next year. The company, which specializes in engine work and is a Pratt & Whitney distributor, also has contracts for overhaul with CAA, TWA international division, and Colonial Airlines.

REDUCED STORAGE—Reduction in hangar rent for the new four-place Piper Clipper from the usual $35 to $30 a month has been announced by Ted Hebert, president of Safair Flying Service, Teterboro, N. J., because the short wingspan Clipper occupies less space and is easier to move in a hangar, he states. Other Piper distributors are expected to make comparable reductions.

VA DELAYING ACTION—As of Jan. 1, Veterans Administration reports, there were 55,543 GI students in flight training. During the preceding six months VA reviewed 27,475 applications for flight courses. Less than half of these were approved. The other 14,025 were taken under advisement with request for better justification of the vocational nature of the training desired. Up to the first of the year 11,077 of the cases under advisement were still dangling without decision. VA had approved 1512 applications and disapproved 1436. Critics of VA policy point out that the delaying action is an effective means of hatcheting the flight program without assuming the onus before Congress of actually rejecting the applications.

779 AGRICULTURAL OPERATIONS—Analysis of statistics supplied to National Aviation Trades Assn. by CAA and Department of Agriculture shows a total of 779 flights operators in the U. S., or an average of approximately 16 to a state, are now engaged in crop dusting, spraying, seeding or other agricultural aviation activities requiring waivers of certain operating restrictions. California has 96 operators in such activities, Florida is second with 50 operators, and Kansas is third, with 47. Other leading states: Iowa, 35; Colorado, 28; and Washington, and Nebraska, 26 each.

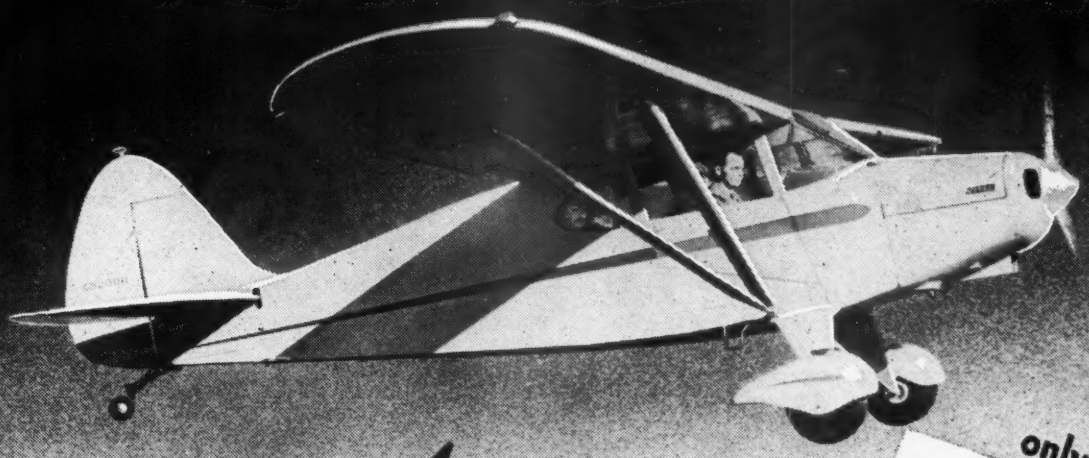
CROSSWIND GEAR AGAIN—Goodyear Aircraft has its crosswind landing gear available now as optional extra equipment on the British Auster Autocraft, described as the leading British utility lightplane. British "Flight" magazine reports enthusiastic reception of the "self-aligning undercarriage" and advises that a small number of sets of components are being made up by Goodyear, "but should there be a large demand more may be made available, possibly at a lower cost."

Current price quoted for the Auster crosswind wheel installation in England is approximately $500. Sales of the gear in Britain and other export sales, while small individually, will add to general acceptance of the crosswind wheels, and combined volume may make possible larger production with resultant economies both for British and American users of the castering wheel.

—ALEXANDER McSURELY

America's Greatest Plane Value

PIPER CLIPPER



A Complete 4 place Plane

only **$2995** (Standard Model) FAF Lock Haven, Penna.

Never in the history of aviation has so much been offered for so little. Piper, always the leader in low-cost practical aircraft, has done it again with the sensational new 4-place Piper Clipper—priced at only $2995.

Here's a brand-new airplane with remarkable performance and lots of roomy comfort—backed by Piper's 18 years of leadership in the light plane field.

Just think of it! Here's a 4-place airplane with 112 mph cruise, 480 mile range, powered with the famous Lycoming 115 horsepower engine. That's a whale of a lot of airplane for less than $3000.

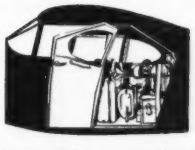
But the performance is even better than the price. Top speed is 125 mph, full-load rate of climb is 600 feet per minute (over 1200 FPM solo). You've probably never flown a plane with as much "get-up and get-out."

You'll get a new idea of aircraft values, a new idea of personal plane performance—see your nearest Piper dealer for a demonstration.

For illustrated brochure, write Piper Aircraft Corp., Lock Haven, Penna., Dept. 1-AW.

DESIGNED FOR PRACTICAL UTILITY

CARGO SPACE



Rear seat is quickly removable for freight. Large rear door makes loading easy. 36 cubic feet capacity.

PLENTY OF ROOM

There's plenty of room in the Clipper. Front seat is adjustable for added comfort.

115 HORSEPOWER

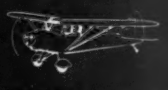
"Round-the-world" Lycoming with new Piper cross-over exhaust for extra take-off power, has starter, generator as standard.

PIPER AIRCRAFT CORP.

LOCK HAVEN, PENNSYLVANIA

PIPER LEADS WITH A PLANE FOR EVERY PURPOSE

PIPER PA-11
Trainer, Sprayer

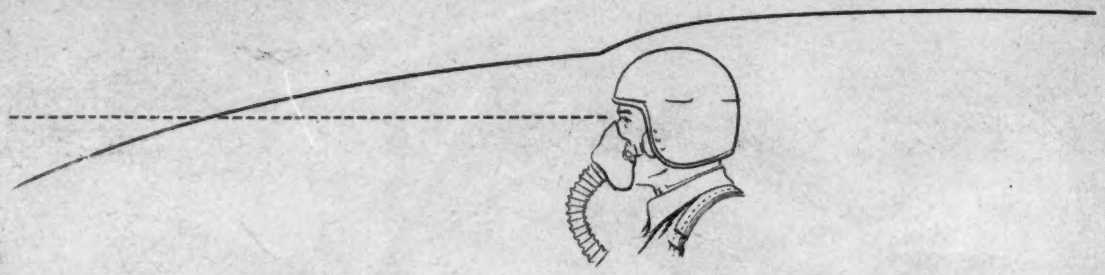


PIPER PA-15, PA-17
65 hp Vagabond

PIPER PA-14
Family Cruiser

PIPER STINSON
Station Wagon

The higher the speed - the greater the need for *Safety Glass* BY "PITTSBURGH"



DESIGNERS of our speediest aircraft faced the problem of providing pilots with clear, undistorted vision, through windshields which—in order to reduce drag—were tilted back at extreme angles. They found the successful solution in Safety Glass by "Pittsburgh."

This glass more nearly approaches optical perfection than any other transparent material. It assures accurate vision for the pilot even when his line of sight strikes it at an extremely acute angle. And Safety Glass by "Pittsburgh" withstands the extremely high pressures and temperatures—and other difficult flight conditions—encountered at super-sonic speeds. In windshields, canopies and windows, it does not craze or become abraded, even after long service.

The aviation industry is welcome to draw freely upon our unexcelled equipment, experience and advanced research, in solving problems that concern airplane glass or glazing. However large or small your company may be, "Pittsburgh" specialists, continuing an aggressive policy of product development, will be glad to consult with you. Write today, you incur no obligagation. Pittsburgh Plate Glass Company, 2134-9 Grant Building, Pittsburgh 19, Pennsylvania.

PPG

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PITTSBURGH PLATE GLASS COMPANY

Skycoach Expansion Gets CAB OK

Popularity of cut-rate nonskeds expected to wane as Northwest's transcontinental proposal is approved.

Proposals for wide expansion of the certificated airlines' four-cents-a-mile domestic skycoach service have received the green light from the Civil Aeronautics Board, thereby posing new threats to cut-rate nonscheduled operations.

Northwest Airlines was slated to inaugurate the first scheduled transcontinental tourist-fare flights late last week with nightly 56-passenger DC-4 roundtrips between New York and Seattle via the Twin Cities and other points. Fare of $97 one-way compares with the first-class rate of $157.85.

▶**More Coach for Capital**—Coincidentally with its approval of NWA's new skycoach operation, CAB authorized Capital Airlines to open 60-passenger DC-4 coach service between New York and the Twin Cities starting Mar. 24 and between Washington and Chicago starting Apr. 1. The four-cents-a-mile fares on these two runs—as on Capital's original New York-Pittsburgh-Chicago "Nighthawk" flights—represent a 35 percent reduction from first-class rail rates and regular air fares.

Meanwhile, these rapid-fire developments marked the skycoach picture:

• **TWA**, which has been operating tourist-rate service between Kansas City and Los Angeles since Feb. 7, said it would ask CAB for authority to start similar flights between New York and Kansas City starting May 1. TWA wants to change the expiration date of the Kansas City-Los Angeles skycoach tariff from Apr. 30 to July 31 and to extend the service to San Francisco.

Rates between Kansas City and New York would be at the same four-cents-a-mile level prevailing on the Kansas City-Los Angeles run, but through transcontinental service will not be offered on the tourist-fare flights.

• **CAB** has scheduled a prehearing conference for Apr. 4 on requests for certificates authorizing transcontinental coach-type service. Six nonscheduled operators are already in the case—Nats Air Transportation Service, Viking Airlines, Airline Transport Carriers, Standard Air Lines, Air America and Economy Airways.

• **Independent Sky Coach System, Inc.**, has asked CAB for a certificate exemption or license to conduct nationwide passenger-cargo coach-type operations. Irregular airlines joining the organization would cooperate in offering services similar to those provided bus riders by the National Trailways System.

The non-profit association of owner-operators would: establish agencies for the sale of through interline tickets and for baggage checking; set up joint air coach depots; arrange for advertising; publish and distribute joint tariffs and consolidated time tables; promote the interchange of business between irregular carrier members at junction points; recommend adoption of uniform colors, insignia and slogans; and promote the adoption and enforcement of a safety code.

Flight Radio Union Protests to Congress

Flight radio personnel, faced with the prospect of losing their $580 per month jobs to pilot-operated radiotelephones, have asked Congress to stop Pan American Airways from using radiotelephones in Stratocruisers which start operating on the West Coast-Hawaii run Apr. 1.

In a letter to members of the Senate and House of Representatives and to the Secretaries of Labor and Commerce, Michael J. Quill, president of the Transport Workers Union of America (CIO), with which Pan Am radio telegraphers are affiliated, appealed for a Congressional investigation aimed at looking into airline efforts "to substitute radiotelephone for radio-telegraphy aboard ocean-spanning craft."

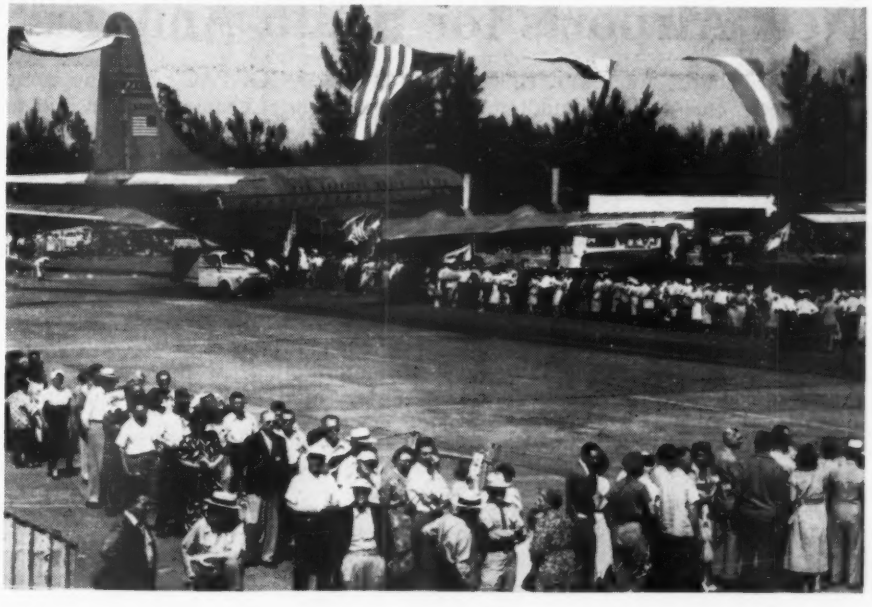
The TWU leader contended that airline use of radio telephones is "motivated by a desire for greater economy at the expense of efficient and safe operation."

Radio-telephones, he asserted, will be the responsibility of the pilot "who is already over-taxed by his duties in operating the most complicated craft in commercial use today."

Quill requested legislation to compel all aircraft on over-water flights to maintain radio-telegraph contact on a frequency of 500 kc., the internationally accepted channel for distress and rescue communication.

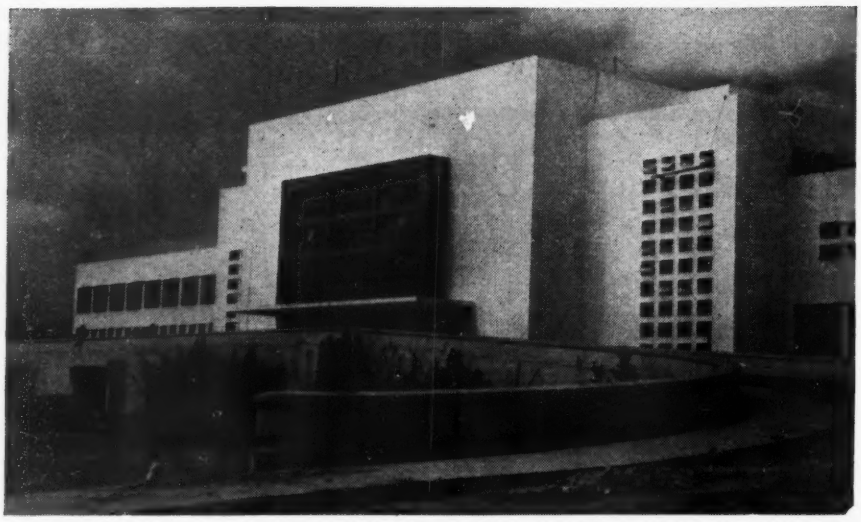
Pan Am officials point out that the airline has been using radio-telephones successfully on the New York-San Juan and New York-Bermuda runs for almost a year.

They claim this equipment is an improved means of communication which is bound to come into more widespread use for over-water flights, and has been used by all domestic airlines for a number of years.

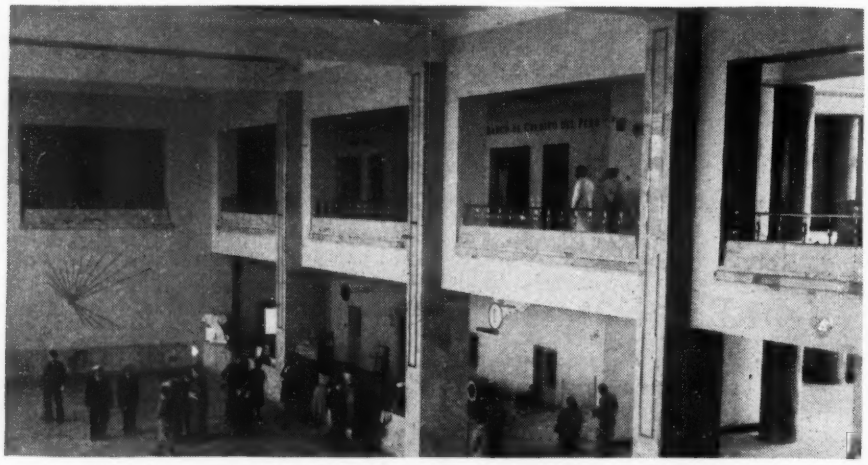


CROWD PLEASER

Getting full measure of publicity from its position at the head of the Stratocruiser delivery list, Pan American Airways is showing its big new planes at key U. S. cities. Here's the result when one was opened to the public at Miami—an estimated 15,000 residents and visitors turned out to inspect the plane during the two-day exhibition.



LIMATAMBO—With heavy borrowing from U. S. designs, the outside looks like La Guardia . . .



. . . And the plain, modern, balconied interior has a resemblance to Washington National.

New Airports for South America

Several South American countries have been energetically building airports which reportedly are on a par with the best the United States has to offer.

First of the new terminals to open is the Limatambo airport which at first glance could be easily mistaken for La Guardia terminal. Conveniently located five minutes from Lima, Peru, the new airport has had a constant increase in traffic since its opening last fall.

▶ **After U. S.**—The terminal building was designed by Max Pena Prado, who spent much time studying blueprints of airports at New York, Washington, and Miami before submitting his own plan.

Limatambo is operated by CORPAC (Corporacion Peruana de Aeropuertos y Aviacion Comercial), a government agency established in 1943 to improve and manage aviation facilities throughout Peru.

CORPAC also runs 80 other airports, 21 of which are currently being modernized and expanded as part of an overall program.

Most of CORPAC's revenue comes from flat rates charged each airline for each kilometer flown over Peruvian territory, according to the type of aircraft used.

▶ **Fee Breakdown**—This covers the use of all airport facilities plus navigational, radio and meteorological services, with charges broken down as follows: 8.2 percent for air-ground voice communication; 32 percent for point-to-point communication; 6 percent for meteorology, and 46.8 percent for landing fees.

According to CORPAC's rate scale, a U. S. carrier operating a DC-6 which makes a scheduled stop at Lima and continues along the west coast of South America would have to pay $349.74 per flight.

CORPAC also charges a 2 percent tax on tickets of passengers flying over Peruvian territory and derives additional income from various airport concessions.

▶ **Buenos Aires**—Argentina's new airport, Ezeiza—rumored to be one of the finest in the world—is under construction near Buenos Aires and is expected to be in operation by this spring.

Ezeiza will have two runways capable of supporting as much weight as those built at Idlewild. A third runway—8528 ft. long—will be able to handle planes twice as heavy as any now in existence.

Airport is designed to accommodate two transports on its aprons at one time and will have twelve gates with corresponding immigration, customs, health, and police inspection facilities available to international carriers. An additional nine gates will be reserved for domestic operations.

According to some CAA officials who recently inspected the site, the new airport will be even better than Idlewild.

▶ **Montevideo** — Uraguay, Argentina's next door neighbor, already is utilizing some of the facilities recently constructed at Carrasco National Airport, near Montevideo.

For the past few months, commercial airlines have been using the three 7550 ft. runways—a fourth runway of approximately the same length will be completed by this summer. New hangars and a terminal building will also be opened soon.

Uraguay currently has the finest airport facilities on the east coast of South America.

Foreign Lines Ponder Europe Tourist Fare

International airlines are stepping cautiously around Pan American's proposal for a $405 roundtrip tourist fare to Europe (AVIATION WEEK, Mar. 14).

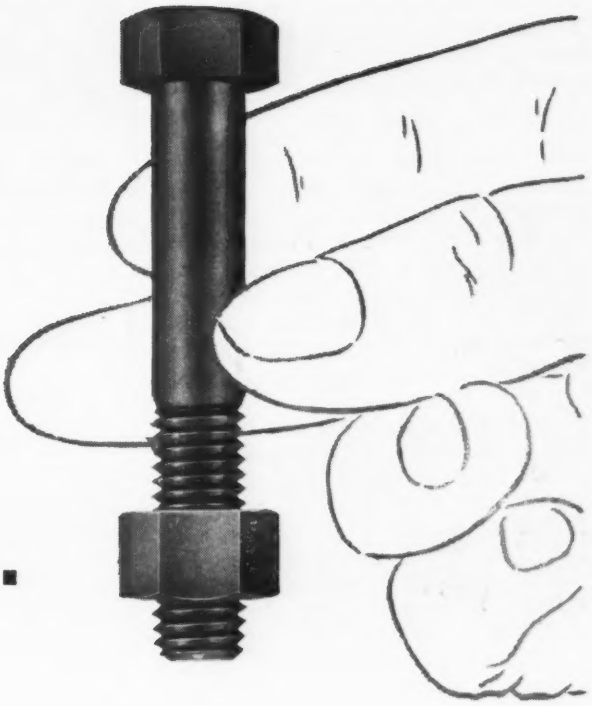
While foreign carrier officials express the desire for tourist fares, many are quick to point out at the same time that most of the airlines may not be able to operate profitably at such low rates. Some of the problems they see:

• **Airlines using Stratocruisers** may be able to operate profitably at tourist rates, but carriers equipped with DC-6s and Constellations may find that such rates won't pay off. Stratocruisers or similar craft won't be standard equipment for all foreign carriers in the foreseeable future.

• **Because of the different type planes** used, it will be difficult to standardize effectively tourist accommodations, and there might also be a wide discrepancy in first-class arrangements. For instance, Stratocruisers obviously could offer more in the way of first-class accommodations than the smaller transports.

• **IATA members** thus far have been unable to arrive at a satisfactory definition of tourist or first-class service.

• **Small airlines,** such as Swissair, might be faced with special problems because



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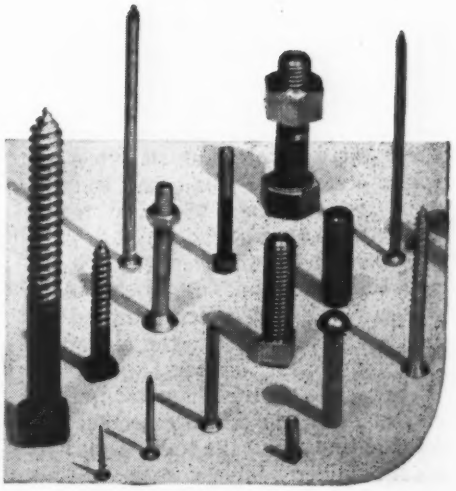


they schedule relatively few flights.

• **Tourist rates** can't be adopted successfully by any airline until IATA members have reached an agreement satisfactory to all. Any carrier attempting to set up tourist rates independently of the others would obviously be prevented from operating in nations owning competing airlines.

Monarch Describes Lightning Effects

A stroke of lightning which blinded a DC-3 pilot for three minutes, shattered his windshield and knocked out the plane's radio and all electrical equipment for five minutes has been described in a recent report by Monarch Air Lines.

The feederline's plane was hit last Dec. 14 while flying between Grand Junction and Durango, Colo., in light snow 12,000 ft. above sea level (2500 ft. above the terrain). It is believed the plane was about 500 ft. below the clouds from which the lightning came. Moderate precipitation static was encountered about five minutes prior to the strike, and lightning was observed five miles away.

▶ **Loud Explosion**—Noise of the stroke was reported as being "very loud—equal to a terrific explosion." Although the captain was blinded for about three minutes, he suffered no after effects. The first officer was blinded for 30 seconds, with no after effects.

▶ **Other Damage Sustained**—Besides shattering the left windshield, the lightning cracked the left side window, burned the paint and pinholed the skin above the left windshield, and shattered the static dischargers on the right wing tip and rudder. Engine operation remained normal.

While the radio and electrical equipment were out of operation for about five minutes, they subsequently became operative. All equipment functioned normally on the ground check after the landing. No blown fuses, burned wire or other indication of damage to the electrical system could be found.

▶ **Controls Not Affected**—The compass, a Pioneer B-16, deflected from the magnetic course of 149 deg. by about 35 deg. clockwise. The discharge did not affect the controls, but the crew reported it felt as if the plane had encountered moderate to heavy turbulence at the time of the strike.

The lightning struck just above the pilot's compartment aft of the windshield. The charge evidently carried out the right wing and left the aircraft at the tip and static discharge wicks. Another section of the charge apparently carried down the fuselage section and left the fuselage at the static dissipaters on the rudder.

Julian S. Johnson, PAA superintendent of training, explains mechanism that controls pitch of the propellers to two Pan Am crewmen who are attending classes.

Learning About the Stratocruiser

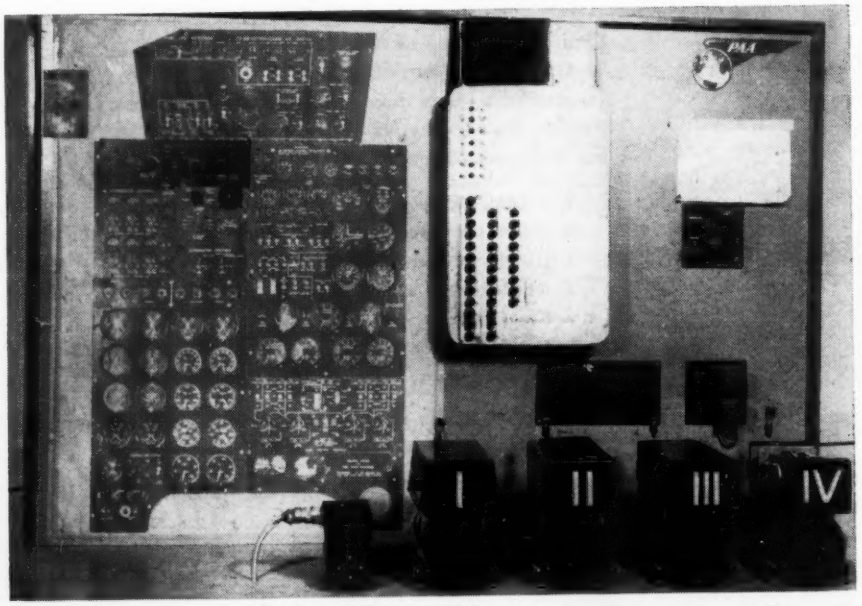
Pan American Airways sets up school for flight crews to study the workings of Boeing's giant transport.

Pan American Airways is giving Stratocruiser flight and ground crews an intensive training program at its San Francisco base, so that the Boeing transport's "all-electronic" control system will be thoroughly understood by crews when the craft goes into service Apr. 1.

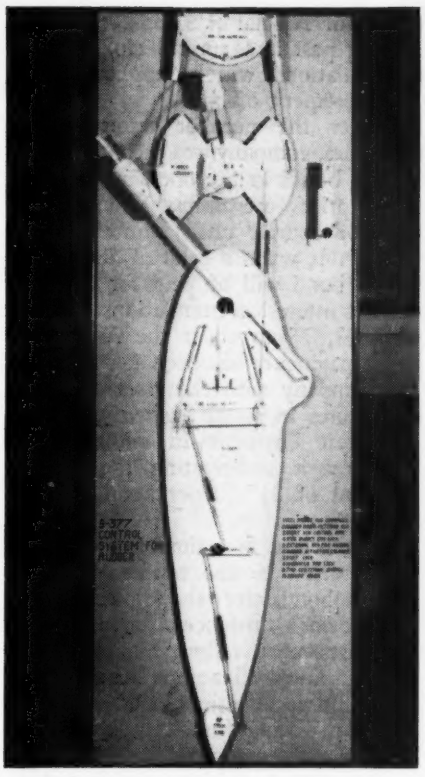
Captain, first officer and second officer-navigator receive 155 hr. of training each; flight engineer, 351 hr., and radio officer 45 hr.

In charge of the ground school is Julian S. Johnson, PAA superintendent of training. Flight training is under supervision of Capt. William Pryce, senior route captain.

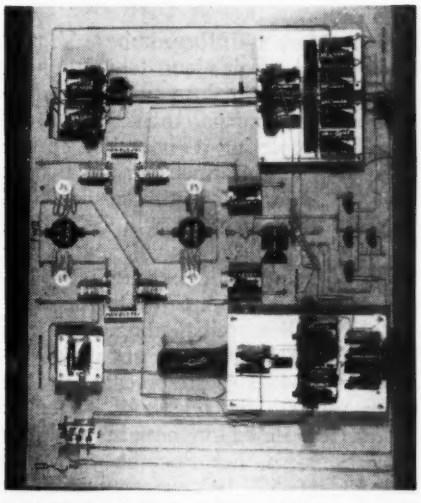
In addition to the San Francisco training, crews will also get 113 hr. in the Dehmel trainer, a mockup that simulates flying conditions, and is constructed to resemble the Stratocruiser cockpit interior.



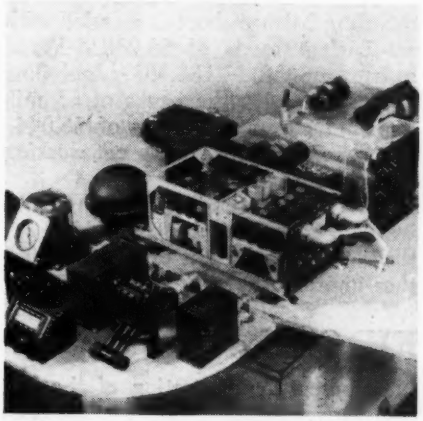
Flight engineers have to master this inverter control mockup before they graduate. Numbered inverters and switches were hooked up to create problem failures.



Control system for rudder is diagrammed by this simple mockup.



Electrical circuit system which operates landing gear is shown in this chart.



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Board Upheld on Nonsked Curb

Senate committee backs CAB's right to amend Section 292.1 of Economic Regulations despite protests.

Nonscheduled airlines' last-ditch attempt to mobilize Congressional support for their case against severe new operating restrictions proposed by the Civil Aeronautics Board has fizzled.

After an all-day closed session with CAB members, the Senate Interstate and Foreign Commerce Committee gave the Board the green light to tighten its control over irregular services by amending Section 292.1 of the Economic Regulations. This section now gives the irregular lines blanket operating authority.

Under CAB's proposed change, each irregular operator using transport-type equipment would be required to justify its case for exemption individually. Ticket agency activities would be curbed. In view of the committee's action, CAB is expected to adopt the change shortly.

▶**CAB Authority Upheld**—"The Board is within its authority under the 1938 Civil Aeronautics Act, and there is no reason why we should hold up its action until Congress can consider legislation on the irregulars or for any other reason," Senate Interstate's chairman, Sen. Edwin Johnson (D., Colo.), told AVIATION WEEK after the session.

Johnson called the meeting after 16 senators protested that the Board's proposed change in section 292.1 might wipe out the nonsked industry. Only two of the protesting senators—Sen. Zales Ecton (R., Mont.) and Sen. Homer Capehart (R., Ind.)—showed up for the closed session, however. Sen. William Knowland (R., Calif.), Sen. Arthur Watkins (R., Utah), and Sen. Pat McCarran (D., Nev.), in addition to members of the Senate Interstate committee and members of the Board, also attended the session.

▶**Defeat Conceded**—Nonskeds conceded that the outcome of the meeting was a major defeat in their fight to stave off crippling economic regulation. But Joseph Borkin, spokesman for the National Independent Air Carriers, remarked that "we haven't given up yet. There are other committees in Congress we can go to."

Following are highlights of the discussion at the Senate Interstate meetings:

▶**Safety**—CAB Chairman Joseph J. O'Connell, Jr., reported that the nonskeds' accident rate in the domestic field for the first nine months of last year was 25.4 fatalities per 100 million passenger miles flown, compared with the scheduled airlines' rate of 1.8 fatalities. O'Connell noted that this evidence was "not conclusive" against the nonskeds.

"Although these figures do seem to speak rather loudly, O'Connell told us, for a number of reasons, not to place too much importance on them," Sen. Johnson declared. O'Connell gave no explanation for a reverse situation in the international field. Over the first nine months of last year, irregular international operators had no accidents. The scheduled airlines' rate was 1.8 fatalities per 100 million passenger miles flown.

▶**Authority**—O'Connell convinced the senators that the Board has authority under the 1938 Civil Aeronautics Act to regulate all nonskeds that are "common carriers", and assured the committee that CAB has no intention of regulating legitimate contract carriers. "Whether scheduled or nonscheduled, contract lines are not subject to the Board's economic regulatory powers", O'Connell said.

▶**Legislation**—Sen. McCarran urged the committee to act on legislation laying down the Board's jurisdiction over irregular operations. "We may do this when we can get around to it", Johnson said. He anticipated, however, that CAB's proposed change in Section 292.1 would be issued long before there would be any action by his group on legislation.

O'Connell minimized the effect that CAB's revised economic regulation would have on the nonsked industry. He said that only 12 to 24 irregulars would be severely affected, out of a total of 2000 nonskeds—114 large and a "scad" of small operators. NIAC claims, that Board regulation would kill off all of the principal nonsked operators, totaling around 60, and wipe out the three most lucrative irregular operations: the New York-Puerto Rico run; the transcontinental route; and the Pacific Northwest-Alaska link.

Capital Calls For Debenture Tenders

A formal call for tenders on its debentures has been issued by Capital Airlines. Operation was made possible by the recent award of $3,150,000 additional mail pay for 1947 and 1948, should improve the financial structure of the company considerably.

Prior to this call, there were $9,850,000 in debentures outstanding. With the earnings made possible by the mail pay, Capital can put money in its sinking fund. A total of $1,353,085, representing past and current sinking fund accumulations, will be applied toward the retirement of bonds.

Under the peculiar terms of the indenture, company was precluded from buying bonds in the open market with lower prices prevailing. Sinking fund can not operate until interest is paid on Apr. 1, when a total of $87.50 per $1000 bond will be paid for past and current interest accumulations. A total of $861,875 to cover the Apr. 1 interest payments has been deposited by the company with the trustee for the debentures to assure such distribution.

▶**Interest Payment**—In addition, the company is anticipating the interest payment of $17.50 per bond on Oct. 1, 1949.

This is the first time the company has resorted to the tender device to obtain bonds for the sinking fund. In previous instances, open market purchases were followed as the total amounts involved were relatively small. With the present amount of cash available for sinking fund purchases, however, the company retains the upper hand in that holders are forced to guess at what price their bonds will be accepted. Tenders will be submitted up until noon, Apr. 4, 1949.

▶**Open Market**—If the number of bonds so tendered are inadequate in number and price compared to prevailing quotations, the company then has the option of completing its operation in the open market. Informed persons believe that at least $2 million principal amount of debentures will be retired by May 1, 1949. This will reduce the then outstanding debentures to less than $7,850,000 compared to the original $10 million outstanding.

Tentative account of financial results for 1948 also are revealed by the company with the release of its tender invitation. Based on certain mail pay allocations, a net income after all charges, of $77,141 was reported for 1948. This compares with an adjusted net loss of $1,533,004 for the year 1947.

Strong balance sheet is revealed with net current assets of $8,038,992 and cash alone of $3,188,803. Including notes payable to the banks of $3 million, net current liabilities of $6,044,306 were shown, leaving a net working capital of $1,994,686.

Civil Aeronautics Board has promised issuance of final mail rate for 1949 for the company which is expected to further improve the outlook for Capital.

FIDO Show

Full-dress demonstration of the first commercial FIDO installation has been set for tomorrow (Mar. 29) at Los Angeles Airport.

Labor Amendments Will Affect Airlines

Airline employes would be subject to the minimum wage provisions of the Fair Labor Standards Act, and all but flight personnel would be put on a 40-hr. basic work week if the amendments to the 1938 Wage-Hour Act approved recently by the House Labor Committee become law.

Extension of the law to cover airline employes is part of the bill's aim to bring government wage and hour coverage to 900,000 additional workers in various industries which are now exempt under the law.

▶ **Exemptions Limited**—The committee, in its report on the bill, stated that its objective is to limit the overtime exemptions for employes in transportation to those who cannot practically be brought under the 40-hr. week "at the present time".

By extending the minimum wage to airline employes and seamen, the committee said it was applying to air and water carriers the same wage requirement imposed on competing forms of transportation—rail, motor carrier and pipeline.

The 1938 law calls for time and a half pay after 40 hr. a week. This would continue, but the bill would raise the statutory minimum wage from 40 to 75 cents an hour.

Radio Group Formed

(*McGraw-Hill World News*)

BRUSSELS—A combined landline and radio network, designed to eliminate present delays in administrative and traffic messages, has been established by 11 European and American scheduled airlines operating on the continent of Europe.

The international telecommunications company, Societe Internationale Telecommunications Aeronautique, plans to link land and radio lines within Europe and with other countries in other hemispheres.

Member companies: ABA (Sweden); DNL (Norway); DDL (Denmark); BEA, BOAC, BSAA (England); KLM (Holland); Sabena (Belgium); Swissair (Switzerland); TWA (USA) and Air France. Each company will pool its existing communications facilities, so that all of the group will acquire new means of communications which high costs did not allow previously. Planned as an early undertaking by the new company: connection of the main European airports to each other.

Headquarters of the company is 192 Rue Royale, Brussels, with administrative office in Paris.

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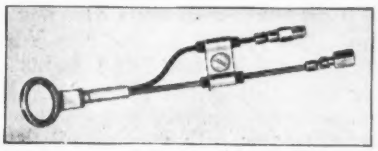

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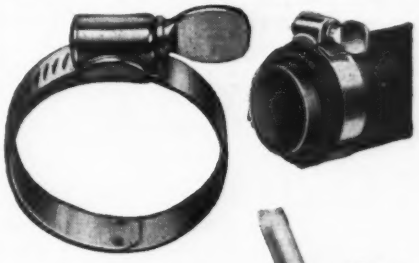

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New Idlewild Hangars

Immediate construction of another permanent hangar costing $1.5 million and large enough to accommodate four Boeing Stratocruisers has been announced by the Port of New York Authority for Idlewild Airport.

New hangar, to be built by Stock Construction Co., N. Y., will adjoin two other hangars of the same capacity, already in first stages of construction.

All three will be steel-arched structures, each with 300 ft. span, and will be completed in 1950 at a total cost of approximately $5.8 million. Existing hangars at Idlewild are two 200 ft. span structures.

Armchair Ticketing

KLM Royal Dutch Airlines, which claims to have opened the first air ticket office in the world 28 years ago, is going all-out for pre-flight comfort. A new ticket office, to be opened in The Hague shortly, will permit KLM passengers to sit in armchairs while being waited upon.

SHORTLINES

▶ **American Overseas**—Has made its 18,000th North Atlantic crossing and has carried 191,558 passengers since inaugurating overseas service in June, 1942.

▶ **Arctic-Pacific, Inc.**—Has applied to CAB for a certificate or exemption to conduct scheduled and nonscheduled cargo service between Fairbanks, Alaska, and San Francisco, both direct and via Seattle. The Seattle-based irregular operator also wants authority to make contract cargo flights within the U. S. and between the U. S. and Alaska and Central and South America. Company has been a nonscheduled operator since August, 1947, and uses C-46 equipment, according to Harrison W. Swanton, president.

▶ **BOAC**—Hopes to take deliveries on its order for six Boeing Stratocruisers in time to begin limited North Atlantic service by next January. First delivery is scheduled for September and the last one by the end of November. Company has already paid nearly $6 million to Boeing for the planes.

▶ **Eastern**—Prescott A. Tolman has been named general sales manager and Robert L. Turner has become general traffic manager.

▶ **Flying Tiger Line**—Has switched its New York operations base from Teterboro Airport to Newark.

▶ **Helicopters Interstate, Inc.**—Has applied for a certificate to carry persons, property and mail on helicopter routes in the Detroit, Cleveland, Akron, Youngstown, O., and Pittsburgh areas. A. A. Walzak is president of the Cleveland company, which now owns one helicopter.

▶ **National**—Has set a new Miami-Havana speed record of 44 min. 41 sec. with a DC-6.

▶ **Pan American**—On Mar. 15 added four more tourist-class roundtrips weekly between San Juan, P. R., and New York, bringing total low-fare DC-4 flights to three daily throughout the week.

▶ **Scandinavian Airlines System**—Plans to schedule nine DC-6 roundtrips weekly from New York to Europe from May 16 to Oct. 15.

▶ **Totem Air Service**—The Seattle-based irregular operator has asked for a CAB certificate or exemption to carry persons, property and mail on schedule or nonscheduled between Sitka, Alaska, and Seattle via Ketchikan and other points.

▶ **Transocean**—Has signed a contract with the Air Force to operate a weekly flight between Fairfield, Calif., and Tokyo in direct support of the Military Air Transport Service. DC-4s which recently participated in the mass evacuation of Europeans from Shanghai will be used on the Tokyo run. . . . TAL's Academy of Aeronautics at Oakland is offering an airline dispatcher's course.

▶ **TWA**—Will extend its Constellation service from Cairo to Bombay, India, Apr. 1. . . . Inauguration of flights to Lancaster, Pa., is slated for Apr. 24.

CAB SCHEDULE

Mar. 28—Hearing in New England States route case. (Docket 2196 et al)

Mar. 28—Hearing on Board's enforcement action against Nats Air Transportation Service. (Docket 3456)

Mar. 28—Hearing in air freight rate investigation. (Docket 1705 et al)

Mar. 30—Prehearing conference on Seaboard & Western Airlines' request for international all-cargo certificate. (Docket 3041)

Apr. 4—Prehearing conference on transcontinental coach-type service. (Docket 2401 et al)

Apr. 11—Hearing on Board's investigation of through service and interchange requirements at St. Louis and Memphis. (Docket 3426)

Apr. 20—Hearing on Chicago & Southern Air Lines' application to abandon service at Bloomington, Peoria and Springfield, Ill. (Docket 3571)

May 2—Hearing in reopened Hawaiian case. (Docket 851 et al)

May 2—Hearing on additional southern transcontinental service. (Docket 1102 et al)

May 16—Hearing on Hughes Tool Co. control of TWA. (Docket 2796)

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Spare Parts & Equipment

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All Cockpits and Radio Installations—Standardized

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All DC-3's have the following Radio equipment installed:

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5. ARN 8 Marker Beacon
6. I.L.S.
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Offered subject to prior sale

760—Engine Mount Sets—Lord Mfg. Co. No. RL15-D-1.
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750—Flap Control Jacks for A-26—Part No. 5191907 -2, -4, -8. (250 of each).
18—Auto Pilots, Minneapolis-Honeywell, Type C-1: Includes vertical gyro, three servo motors, dynamotor, control panel, amplifier, PDI, down lock and directional dampener.

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STRICTLY PERSONAL

NATIONAL DERAILS A CUSTOMER—This lively press release from **Hoite Agey**, National's publicity tycoon, is worth reprinting because we know you won't see it in your Railway Age next week:

Capt. Jim Sammons, National Airlines pilot, got off the Long Island train at Kew Gardens, L. I., Monday night. Standing for a moment in the crowd, he noted a man poring over a long string of railroad tickets—destination, West Palm Beach.

Sammons gave in to a sudden urge.

"Excuse me, sir, but you certainly are taking a long, roundabout way to Palm Beach. I'll be down there tonight before you're hardly out of Penn Station."

"Tonight?" the man queried.

"Yes sir—flying down, as soon as I check by the hotel and go out to Idlewild Airport."

"But I checked the air schedules," the man persisted. "It takes 8 hours."

Sammons assured him his scheduled time was 4 hr. 20 min. for the DC-6 flight, despite a stop at Washington.

"I'm going with you," the man announced.

He did—and in considerably less than 4 hr. 20 min. It was National's fourth record flight of the day—2 hr. 15 min. from Washington to West Palm Beach.

* * *

HOT DOGGEREL—Ever since this pillar of whimsy began we have fought off the po'try and doggerel. But this week we cave in, and give the long-suffering copilot a moment's thoughtful salute with this contribution from **John P. Menerick**, operations agent for Capital Airlines at Bristol, Tenn. He hints it was on the company teletype:

I Am Just A Stooge

I am the copilot. I sit on the right.
I'm not important. Just part of the flight.
I never talk back lest I have regrets,
But I have to remember what the pilot forgets.

I make out the flight plan and study the weather,
Pull up the gear and stand by to feather.
Make out the forms and do the reporting,
And fly the old crate when the pilot's courting.

I take the readings, adjust the power,
Handle the flaps and call the tower,
Tell him where we're at the darkest nights,
And do all the work without any lights.

I call for my pilot and buy him Cokes,
I always laugh at his corny jokes.
And once in a while when his landings are rusty,
I come through with "Gawd, but it's gusty."

All in all I'm a general stooge,
I sit on the right of the man I call Scrooge.
I guess you think I'm not understanding.
But maybe someday he'll give ME a landing.

* * *

"TRULY AN AIRMAN'S AIRLINE"—Congratulations are sent by Transocean Air Lines' **S. A. Nichols**, secretary, to Chicago & Southern for the piloting experience of its executives. But Nichols wants us to know that TAL is "truly an airman's airline, and we are particularly proud of the flying prowess of our directors and officials."

For instance: The six directors have flown over 80,000 hr., mostly as airline captains. President and chairman **Orvis M. Nelson** has 13,000 hr.; **John M. Hodgson** 12,000; **Sidney J. Nelson** 15,000; **Warren D. Williams** 18,000; **Col. Ray T. Elsmore** 18,500, and **W. E. "Dusty" Rhoades** 12,000.

Col. Roger Q. Williams, assistant to the president, has 20,000 hr., and **E. H. Borgard**, supt. of maintenance, "was a veteran airline pilot before he became a leader in the maintenance field.

"We firmly believe this know-how and alert judgment which our top management gained at the controls of airliners is responsible for Transocean's rapid rise to leadership among the contract air carriers of the world," Mr. Nichols says, adding, "Long may your column continue; we like it very much."

R. H. W.

WHAT'S NEW

New Books

"Aviation Mechanic's Aircraft Manual," by John W. Vale, Jr., 748 pages, published by McGraw-Hill Book Co., Inc., 330 W. 42 St., New York 18. Price $6.

"Dictionary of Aviation Terms," (1944) by Juan K. Serralles, senior instructor, Casey Jones School of Aeronautics, Inter-American Dept. Written especially for the translator of aeronautical material, since dictionary is English-Spanish and Spanish-English. 131 pages, published by McGraw-Hill Book Co., Inc., 330 W. 42 St., New York 18. Price $3.

Trade Literature

"Handy Light Signal Guide," a device which gives quick reference to meanings of light signals, available upon request to Tucson Municipal Airport, Tucson, Ariz. Enclose self-addressed, stamped envelope.

"Clarostat Catalog," showing company's complete line of resistors, controls and resistance devices, available upon request to Clarostat Mfg. Co., Inc., Dover, N. H.

"Specialists in Stainless," an 89-page catalog of stainless steel fasteners and engineering data, available from All-metal Screw Products Co., Inc., 33 Greene St., New York 13.

"Bulletin 3700," describing the Sperry Reflectogage, a portable ultrasonic instrument for measuring thickness of materials from one side only, is available upon request to E. B. Lang, Adv. Mgr., Sperry Products, Inc., Danbury, Conn.

Books In Preparation

(Further information on any of these books is available from McGraw-Hill Book Co., Inc., 330 W. 42 St., New York 18.)

"Engineering Supersonic Aerodynamics," by E. Arthur Bonney, Johns Hopkins University. Summer publication.

"The Airplane and its Engine," Fifth Ed., by C. H. Chatfield, C. F. Taylor and S. Ober, MIT. Summer publication.

"Gas Turbines for Aircraft," by Frank Godsey and Lloyd Young, Westinghouse Electric Corp. May publication.

"Airline Traffic Procedures," by Gene Kropf, Parks College. April publication.

"Aircraft Maintenance & Repairs," by Northrop Aeronautical Institute. March publication.

"Aircraft Structures," by D. J. Perry, Pennsylvania State College.

ADVERTISERS INDEX

AVIATION WEEK
MARCH 28, 1949

American Chemical Paint Co. 45
Agency—May Advertising Co.
Ames Co., B. C. 49
Agency—Henry A. Loudon Adv., Inc.
Auburn Spark Plug Co., Inc. 4
Agency—Spitz & Webb Adv.
Du Pont de Nemours & Co., Inc., E. I. Third Cover
Agency—Batten, Barton, Durstine & Osborn, Inc.
Eclipse-Pioneer Div. of Bendix Aviation Corp. .....Second Cover
Agency—MacManus, John & Adams, Inc.
Electrical Engineering & Mfg. Corp. 34
Agency—West-Marquis, Inc.
Fafnir Bearing Co., The 5
Agency—Horton-Noyes Co.
Fenwal, Incorporated 8
Agency—James Thomas Chirurg Co.
Garrett Corporation, The 9
Agency—J. Walter Thompson Co.
General Electric Co. .....Fourth Cover
Agency—G. M. Basford Co.
Grumman Aircraft Engineering Corp. Front Cover
Agency—Charles W. Hoyt Co., Inc.
Gulf Oil Corporation 20
Agency—Young & Rubicam, Inc.
Hoover Electric Co. 36
Agency—Anderson Adv. Agency
Hotel Lexington, Inc. 49
Agency—Elmo Ecker Advertising
Indiana Gear Works 22
Agency—A. L. Perkins & Co.
International Nickel Co., Inc., The 41
Agency—Marschalk & Pratt Co.
Lebanon Steel Foundry 24
Agency—Foltz-Wessinger, Inc.
MacWhyte Co. 3
Agency—Needham, Louis & Brorby, Inc.
Marman Products, Inc. 23
Agency—West-Marquis, Inc.
Marquette Metals Products Co., The 32
Agency—Belden & Hickox Adv.
Monsanto Chemical Co. 29
Agency—Gardner Advertising Co.
Piper Aircraft Corp. 37
Agency—Strohmeier Associates
Pittsburgh Plate Glass Co. 38
Agency—Batten, Barton, Durstine & Osborn, Inc.
Radio Corp. of America 10
Agency—J. Walter Thompson Co.
Searchlight Section 46, 47
Thermo Electric Co. 45
Agency—Fred Lange Associates, Inc.
Tinnerman Products, Inc. 43
Agency—Meldrum & Fewsmith, Inc.
U. S. Steel Corp. 19, 31
Agency—Batten, Barton, Durstine & Osborn, Inc.
Van Dusen Aircraft Supplies 49
Agency—Strohmeier Associates
Wilcox Electric Co. 27
Agency—Arthur G. Rippey & Co.
Wittek Manufacturing Co. 45
Agency—The Advertising Corp.
Wyman Gordon Co. 6
Agency—John W. Odlin Co., Inc.

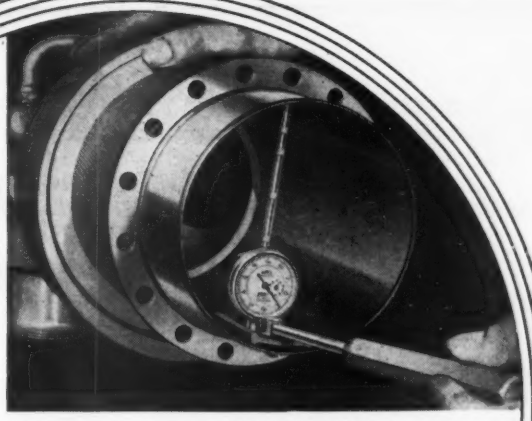
SEARCHLIGHT SECTION

(Classified Advertising)

EMPLOYMENT
Positions Vacant 46, 47
Positions Wanted 46
Selling Opportunities Wanted 46
EDUCATIONAL
Schools 46
BUSINESS OPPORTUNITIES
Offered 46
EQUIPMENT
(Used or Surplus New)
For Sale 47

AMES

Instantly Accurately Safely . . .



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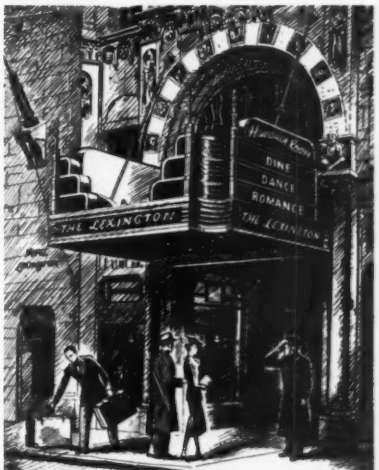

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NEW YORK "HEADQUARTERS"
OF AVIATION EXECUTIVES

Hotel Lexington
LEXINGTON AVENUE AT 48th ST., N. Y. C. 17
HOME OF THE *Hawaiian Room*
CHARLES E. ROCHESTER, *President*
George W. Miller, *Resident Manager*

EDITORIAL

Stunt or Achievement?

Sometimes aviation people let commercial or service competition give them astigmatism. We have heard several sneers lately about "stunts." Bill Odom's 5000 mi. non-stop flight in a Continental-powered Beech Bonanza was a stunt. The Air Force's round-the-world B-50 non-stop flight was a stunt. So it goes.

Now, it seems to us that if there is any group in the world who should appreciate the difference between achievement and a "stunt," it should be those who know most about the business.

If you want to sneer about it, the first flight of the Wright Brothers was one of the biggest stunts the world ever saw. So have been most other triumphs of flight, if you are in the disparaging frame of mind. The fact that some of these technical and technological successes win flambuoyant publicity may be a temporary source of pique to a rival company or a rival air service, but we think, in a business with as much public appeal as aviation has, such publicity has genuine value.

We suspect the bus lines and the railroads and the battleship people would give a lot to be able to win the favorable publicity that aviation reaps every year. And the millions and millions of dollars Congress appropriates for new aircraft is not without public approval, you can be sure. So thank publicity and aviation achievement for some of those dollars. And another thing, would you rather have an epidemic of smash headlines about a "stunt" like Bill Odom's or about a "flaming airliner crash"?

We think there's a whale of a difference between achievement and stunts. But if you are going to keep on calling them stunts, smile when you do it, podner.

Which Will You Bet On?

Here's a study in contrasts:

(1) **Pan American,** now taking delivery on 20 giant Boeing Stratocruisers, gives notice through its aggressive President Juan Trippe that it looks ahead to the time not long distant when it can provide low cost fares to Europe, the Orient and South America, with perhaps a tourist class fare to Europe at something like $225, contrasting with a recent winter excursion rate of $466. The same airline has piled up valuable experience running 63-passenger DC-4 skycoaches between New York and Puerto Rico, and this month it extended coach service to Rio de Janeiro and Buenos Aires.

Says Mr. Trippe: "The people want tourist class air service, and it is here to stay."

(2) **United Air Lines,** also soon to take delivery on a fleet of giant Stratocruisers, has declared through its President W. A. Patterson, that it does not believe in the air coach type of operation, and has no intention of instituting it. United is probably the outstanding example of those who contend air transportation should be restricted to one-class, luxury service, complete to full course meals.

It is a neat trick if they can do it, but we think United is dead wrong. We think Pan American is both alive and right. We shall watch with keen interest how United fills its big new transports without any fare cuts, while Northwest and TWA are energetically scurrying across the country with special coach planes, several hours slower, perhaps, but many dollars cheaper. And if American doesn't enter this coach picture before long we will abandon all attempts at forecasting.

Air transportation will never become mass transportation until the masses can afford to use it. Until the masses fly, we haven't a ghost of a chance of reducing government subsidies. Unfortunately, some industry people seem to have not the slightest interest in cutting down subsidies. They rebel against any new competition, such as the irregulars, which might show up any of their current expenditures as unnecessarily high or which might set up a yardstick of efficiency. They prefer inefficiency because it pays off better.

These are harsh words, but it is difficult to see how much longer we can afford to shovel out subsidies with one hand, while holding off with the other hand all new competition which clamors for an opportunity to show what it can do, cheaper and more efficiently. Public opinion simply is going to bring a change.

We think United, and its school of restriction rather than growth, has made an honest mistake. We also predict that UAL will have a lower fare schedule well within six months. In other words, our bet is on Pan American.

New Services to Readers

AVIATION WEEK appreciates the many letters of commendation from readers on its Yearbook Edition Feb. 28, An Inventory of U. S. Air Power; its publication last week of the 16-page Air Transport Facts & Figures with a complete statistical summary of the airline industry, and our new weekly feature introduced on Mar. 7, reporting latest Air Force contract awards to industry.

These are concrete examples of an aggressive expansion in AVIATION WEEK's editorial service to its readers. Other new features and services are contemplated, and will appear throughout the year.

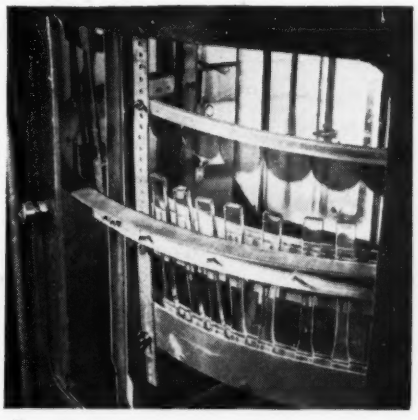
We are grateful to you for a constantly growing number of letters, and hope you will continue writing. Constructive criticism and complaints are often more enlightening and helpful than those of praise. If there is any way AVIATION WEEK can be made more valuable to you and your business why not drop us a line at 330 W. 42 St., New York, N. Y., and tell us how?

ROBERT H. WOOD

In new plane production

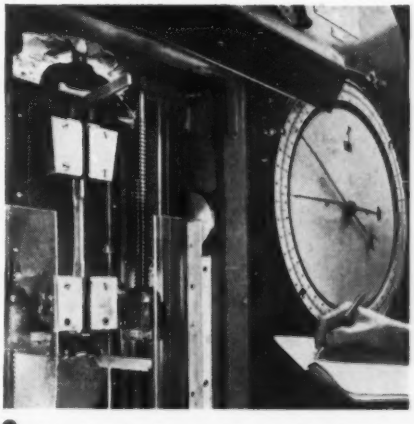
SPECIFY DU PONT "LUCITE"

FOR ALL THESE ADVANTAGES:



1. "Lucite" is weather-resistant. "Lucite" acrylic resin retains its transparency in spite of rain, snow, sunlight, heat, and sudden temperature changes. This has been proved by actual use in many airplanes.

2. "Lucite" is crystal-clear. Transparent "Lucite" sheeting surpasses government specifications for optical uniformity and high light transmission. (Visible range, 90-92%.) It provides clear, *undistorted* vision.



3. "Lucite" is strong. Has relatively high tensile strength (7000-8000 P.S.I.) and flexural strength (12,000-16,000 P.S.I.). Has low coefficient of linear thermal expansion, good rigidity, and stability... resists shattering.

SPECIFY "LUCITE" FOR BEST RESULTS!

"Lucite" acrylic resin had a distinguished service record in World War II, where it was used for astrodomes, turrets, nose blisters, canopies. Also used in the windshields and windows of leading commercial, military and private airplanes. Shatter-resistant laminated "Lucite"-"Butacite" was chosen for the sighting domes in the B-29 bomber. "Lucite" is supplied in sheets of various sizes.

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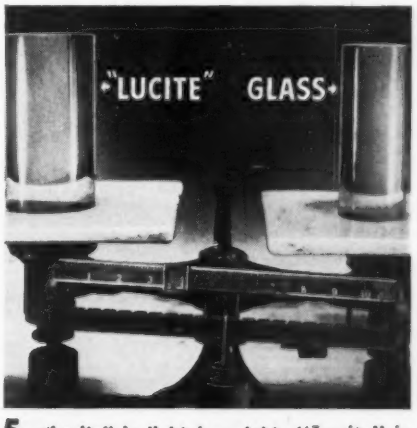
4. "Lucite" is workable. Its inherent qualities assure excellent performance during machining and forming. Can be sawed, drilled, beveled . . . formed readily into deep compound curves . . . *without special tools.*



5. "Lucite" is light in weight. "Lucite" is only 50% as heavy as glass. Less than half as heavy as duraluminum, less than one-sixth the weight of steel . . . and less than one-seventh the weight of copper!

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- ACTUATORS
- GENERATORS AND TRANSFORMERS

"Top-Flight" engine performance played a large part in the establishment of the new world speed record set by the F-86, powered by a General Electric TG-190 (USAF Type J47) turbojet. "Top-Flight" men also had a large role. One of these men is E. S. "Tommy" Thompson, Manager of Sales for the Aircraft Gas Turbine Divisions, shown accepting one of the triplicate awards made to the Air Force, North American Aviation, and General Electric by the National Aeronautic Association.

Tommy was in on the design and production of the first turbojet engine in the United States—the General Electric IA. Tommy worked with England's Whittle, Air Force officers, airframe manufacturers, and expert design men like Sam Puffer and D. F. "Truly" Warner. He supervised the installation of the historic IA engine and saw it grow from a plan to a practical, powerful reality.

Today G-E research and engineering are continuing to serve the aviation industry by developing and producing engineered systems and precision products for aircraft. Take your problems to the G-E office nearest you, or write *Apparatus Department, General Electric Company, Schenectady 5, New York.*

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